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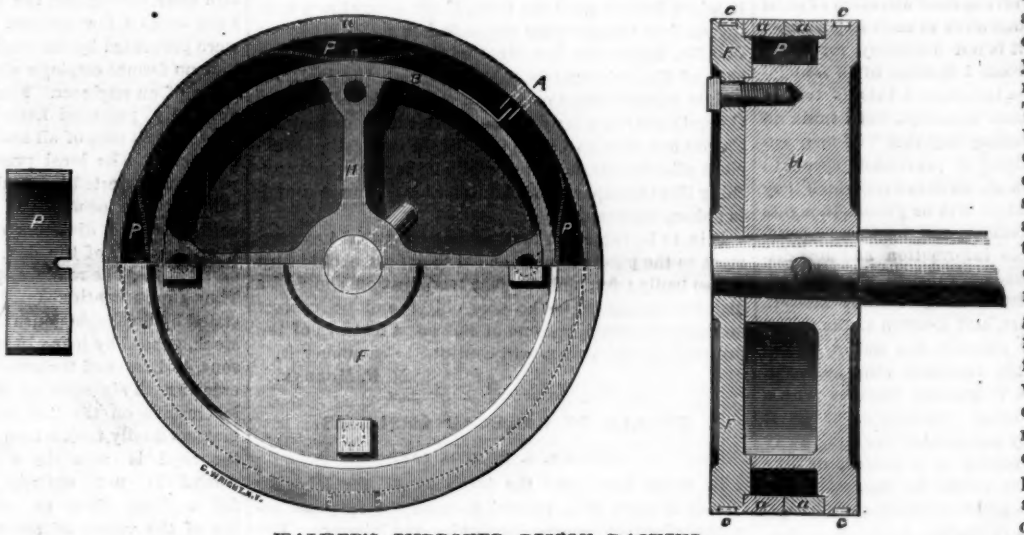
WALKER'S IMPROVED PISTON PACKING.

A book which would illustrate and describe *all* the different kinds of piston packing which have been used would make a large volume. It would be a curious illustration of the variety of ways in which the human mind will try to solve what apparently is a very simple problem. We give herewith an illustration of a piston which has the merit of simplicity and the recommendation of parties who have used it. The cut alone would be a sufficient description of its construction. The end view represents the piston with one-half of the follower plate removed and shows the springs, *P*, *P*, *P*, and packing rings *a*, *a*. The figure on the left represents a plan of one of the springs. *c*, *c*, are rings turned in the piston head and follower, which are filled with babbitt metal. *H* is the piston head or "spider," *F*, the follower plate, and *B*, a ring cast on the piston head. At *A*, a couple of pins are shown riveted into the packing rings, which are prevented from turning by an angle plate attached to the ring on the piston head. The springs are also held in position by pins shown in the upper half of the end view, which are received by the slot shown in the plan of spring in the left. The illustration is drawn to a scale of one-fifth, and represents a piston for a 15 in. cylinder.



WALKER'S IMPROVED PISTON PACKING.

The packing rings are cut on the bottom of the cylinder, the point at which the weight of the piston will keep it tight. The originator of this packing says:—"It may be made much lighter in all its parts than most others, more especially in the rings and springs. The work required of them being only to pack the cylinder and the weight of piston not being carried or resting on them, consequently a uniform tension of spring may be obtained and maintained."

This packing can be used on any ordinary pistons, provided they very nearly fill the base of the cylinder, by simply shrinking a ring in the bolt lugs of the "spider."

It has been in use on a half-dozen engines for over 18 months, and is said to have worked very satisfactorily. The piston should be turned 1-32 of an inch less diameter than the bore of the cylinder, and the springs should be made very light, steel 1-16 in. thick and 6 in. in length is heavy enough for locomotive pistons.

The inventor is E. A. Walker, Master Mechanic, Cape Cod Railroad, Hyannis, Mass., of whom any information concerning it can be obtained.

—A bill for a general railroad law has been offered to the present Legislature of Vermont. It provides that any number of persons, not less than twenty-five, may form a railroad company, with not less than $10,000 of stock for every mile of road to be built by them, $1,000 of which must be subscribed, and ten per cent. paid thereon, in good faith, before they can organize; and may build a road anywhere in the State, except upon or across the streets of any city or incorporated village, for which the assent of the city or incorporated village is necessary.

—Mr. James D. Reid, chairman of the Morse Testimonial Fund, announces that the statue which is to be erected in Central Park must be of bronze instead of marble and that the cost will be $10,500, nearly two-thirds of which has been subscribed by telegraphers. Others are now invited to subscribe, and railroad men may send their mites to Mr. Reid, at No. 145 Broad New York.

Contributions.

THE PREVENTION OF ACCIDENTS.

To the Editor of the Railroad Gazette:

I noticed an article in the Gazette of Nov. 12, from a correspondent wherein he complains that in an article in the Gazette of September 24, on the "Prevention of Accidents" no mention was made of the men who have to bear the burden in all railroad accidents.

The object of the article referred to by Mr. Jaxon was mainly to call attention more particularly to the prevention of that class of accidents which is caused by defects in the material of which track and rolling stock is constructed and to suggest means for the prevention of accidents as far as possible by the use of new mechanical contrivances and scientific researches into the nature of material, and to ascertain by experiment the result of long continued use of material which often gives way without exhibiting any outward signs of weakness. Many railroad men believe that a car axle is safe to run until it has become worn so as to give unmistakable signs of weakness, but scientific investigation proves that axles after being in use for certain lengths of time, or rather when they have performed a certain amount of labor, are likely to break at any time; and they frequently break in places not subjected to wear, while the journals, which have been badly worn, remain sound. This fact will enable the builders of rolling stock and the manufacturers of the material from which it is made to produce axles superior to any heretofore in use and thereby in a great measure prevent a serious class of accidents.

A great many collisions might be prevented by the use of the right kind of brakes, and the use of signals properly arranged for that purpose, and accidents at switches may be effectually prevented by mechanical means now in use on some roads and which are rapidly coming into general use. These and other accidents may be prevented by the use of mechanical contrivances and it would naturally be a portion of the business of the "Association" to determine through its officers or agents as to the most efficient apparatus with a view to adopt the best. I mention the above to show that if, as Mr. Jaxon says, "the supervisors or road-masters" have to bear the burden of *all* railroad accidents, they are certainly much abused and entitled to the sympathy of the community. He says: "while these men have charge of a roadway with poor drainage, bad surface and line, without the means to better its condition, the results are as follows: 1. 20 per cent. more wear on rolling stock, and the engines cannot pull so much for the grades are doubled when the track is in bad surface and line. 2. Flat wheels, trucks out of square, outside bearings down so hard that trucks cannot curve. 3. The wear of the iron in track is 50 per cent. more than if in perfect order. 4. The suggestions of theorists or unpractical men are more readily adopted than those of practical men who have spent a lifetime in constructing bridges and trestles for the safe transit of life and property. You can sum up the sole cause of many accidents from the four alluded to above. Then I would ask track and bridge men if it is not time to wake up and vindicate their own rights as well as those of the traveling public."

Now it is difficult to see how a road-master should have to bear the burden of a collision, unless he should be in charge of one of the trains, which is sometimes the case. Who would be so unreasonable as to charge him with the blame of a train running off a misplaced switch when he was miles away at the time, or who would have the hardness of heart to say he was the cause of the explosion of a locomotive boiler, or the breaking of an axle, or any other of the long list of accidents which it is beyond the power of the road-master to prevent? There are those who would not scruple to charge the blame of an accident to an innocent person when they themselves are the guilty ones, and track men are frequently censured when they do not deserve it. But in regard to drainage, bad surface and line, if these defects are not remedied it would seem to be the fault of the roadmaster. The most important matter connected with track repairs is thorough drainage, and as this duty devolves on those in charge of that work it would not be out of place to charge the blame of any disaster arising from a neglect of this important duty to the roadmaster. Insufficient drainage is either directly or indirectly the cause of much serious trouble. It is impossible to keep track in good surface or line unless it is thoroughly drained and there can hardly be any excuse for any short-comings on the part of the roadmaster in this respect. Although, as Mr. Jaxon says, "these men are directed by *theorists* "*or inexperienced men* or else working "with hands tied by false economy," by which means they are not allowed a sufficient force of men to do *everything* at once, the road-master would serve his own interests as well as those of the company by attending to drainage, and leave other matters of less importance until that is completed, even if it is done to the exclusion of all other work. Track may then be put in surface and line to some purpose. There are road-masters who complain that they are not allowed men enough to keep track in anything like good running order, yet they will keep what men they do have *churning* and splashing about in the mud in narrow, undrained cuts, in their vain efforts to keep track in surface. Thousands of dollars are expended in this manner for labor, where hundreds would suffice if the labor were put in the right place, *i. e.*, in the ditches. As to trouble arising from flat wheels, trucks out of gear, etc., it would be unfair to charge it to the bad condition of the track, or to the fault of the track-men, as the duty of removing damaged wheels and keeping rolling stock in repair belongs to others, who, like the road-master, may be obliged to resort to any makeshift he can contrive. A car or locomotive in good order might run with tolerable safety on a track considerably out of order, or perhaps a flat wheel or a car otherwise out of order might

run for a time on a good track without causing mischief, but in case of an accident under the latter circumstances, no one could honestly blame the track-men; but when both track and rolling stock are in an unsafe condition, its a pretty sure indication that "there is a screw loose" at headquarters, and the blame should properly rest there. It is a narrow policy that "ties the hands of track men and bridge carpenters," but there are hundreds throughout the country that might with reason join Mr. Jaxon in his complaints in this respect. There are, however, a great many who do not make proper use of the means at their command, and it is difficult for these men to find any better excuse for the bad condition of matters under their charge than that "their hands are tied." Perhaps the "Association" to which your correspondent refers would not be a great benefit to this class of men, although it would be likely to afford them some relief by way of awakening a more lively interest in all matters pertaining to their department of railroad management. If such an organization were effected, a primary object would be to ascertain the *causes of all railroad accidents* and then to devise ways and means for their prevention. Much valuable information would doubtless be obtained as to the causes and the *origin* of these causes, and when it became known to what exttent their damage account is chargeable to certain causes, those that prove the most serious would be very likely to be attended to. A certain amount of the damage account would be found chargeable to defective wheels; and defective axles would come in for their share; and bad workmanship, poor material, defective rails, decayed ties, insufficient drainage, lack of "help" —either mechanics or laborers, in any department,— carelessness, ignorance or stupidity of operatives, by which certain classes of accidents occur. All these and many more would receive special attention of chief managers when they became alive to their importance.

But it may be said that it is not necessary for a railroad superintendent to become a member of an association to be aware of all these things, and this is true of some who are acting in that capacity; but I think no one will deny that a "coming together" of men engaged in any particular calling or profession serves to awaken a deeper interest in all matters with which they have to deal. Many new ideas will be gained, thoughts will be turned into new channels, and no stone left unturned in search of valuable information and new discoveries. There are hundreds of railroad superintendents who have no time to investigate these matters closely. An accident occurs, and as soon as the wreck is cleared away and order restored, the duties of the managing officer demand his attention elsewhere, and he hardly has time to give it another thought with a view to preventing a similar occurrence, unless it should have been caused by the sudden washing away of an embankment, the falling of a bridge, or like causes,a remedy for which would be suggested at a glance. But in cases of accidents requiring investigation in order to ascertain how similar occurrences may be prevented, this might be attended to under the management of an association, and the entire railroad community and the community at large be benefited thereby.

I can conceive of no surer cure for the evils arising from the penny wise and pound foolish policy that ties the hands of the men who have to bear the burden than an association of the kind and for the purpose in question. Of course any such organization to be effective must be well managed by *practical men*, and such as have, as your correspondent says, "spent a lifetime" in railroading and had their eyes open, should "have their say." Kid glove engineers and counting-house managers and directors would hardly be successful in bringing about a better state of affairs without the assistance or co-operation of hard-handed practical men, and if any such association should ever be formed, no doubt those men whose hands are tied and mouths gagged would be released and their voices heard in council.

Wm. S. H.

MR. EVANS' CRITICISM OF THE FAIRLIE ENGINE.

The GAZETTE of the third inst., contains the remarks of Mr. Walton W. Evans, addressed to the Master Mechanics Association; under which the Fairlie engines, Little Wonder and Progress, are brought into comparison with the San Bernardo and Conquistador engines, constructed under the direction of Mr. Evans.

It would have been much more creditable to this gentleman, if, instead of indulging in sarcasm and invective and in personal reflections, he had shown a disposition to encourage an attempt to introduce a very important and much needed improvement in the equipment of railroads. Mr. Fairlie, without doubt, has made serious mistakes in the proportions and arrangement of his machines, but does it follow, that the San Bernardo and Conquistador are, "the *ne plus ultra*" of locomotive engines? or does Mr. Evans imagine that the comparison he has brought forward will altogether meet the spirit of the present era in railroad progress? Mr. Evans' strictures upon the defects of Mr. Fairlie's engines would have been more acceptable if they had exhibited that degree of indulgence which is due to every attempt at mechanical improvements. Exaggerated statements of the performance of favorite engines, in a remote region of South America, are not satisfactory.

The Conquistador is, undoubtedly, a very fine engine, gliding round curves of 350 feet radius with the smoothness of a velocipede and ascending grades of 211 feet to the mile with 100 tons net cargo, or 190 tons gross load, utilizing only 29 per cent. of the tractive adhesion! Possibly, in the climate of the Cordilleras, the driving wheels constantly retain the maximum of adhesion. Here in Illinois we are not so fortunate; we have Baldwin engines and Rogers engines, supposed to be of the best construction, yet it is a very common occurrence that on grades of 30 or 40 feet to the mile, they fail to ascend with their loads without auxiliary engines, and in starting heavy trains the drivers lose their adhesion, and, even with the use of the sand box, repeated efforts have to be made before sufficient momentum is obtained.

Notwithstanding these results, the adhesion at command is too costly, when the deterioration of the rails is considered. This is a fact that requires no discussion, for steel rails have become a matter of course in the renewal of railroads with large traffic. Had Mr. Fairlie succeeded in adding to the tractive adhesion by multiplying driving-wheels, while the pressure upon the rails was proportionally diminished, he would not have deserved the ridicule of Mr. Evans, when asserting that they would last *just* three times as long as they usually do; for unscientific as the expression may be, it might be very near the truth if the weight now resting on four wheels were supported on eight. It seems that Mr. Fairlie has lost sight of this principle; for on each of the eight wheels of the Progress, the insistant weight exceeded that on each of the six wheels of the Conquistador by nearly 2½ tons. But it seems that Mr. Fairlie has also essentially failed in generating sufficient effective steam power, while he has not given anything like the capacity he claims for his engine in rounding sharp curves.

It is to be regretted that so important an improvement as the public have been led to expect should turn out so badly; for, unless some modification should be discovered adapted to the true object and on correct mechanical principles, one of the worst features of the present railroad system will continue to encumber it.

R. P. Morgan.

STRIKES OF RAILROAD EMPLOYES.

BY WM. S. HUNTINGTON.

To those who have the interests of the laboring classes at heart it is painful to read the frequent accounts of strikes among mechanics and laborers. The result of strikes cannot be otherwise than disastrous to these classes, whose families are dependant on their labor for bread; and thousands of honest, hard-working mechanics never recover from the effects of their persistant refusal to accede to the terms of their employers. But, notwithstanding the manifold evils arising from strikes, it is difficult to suggest a remedy. The relations of labor and capital have received the earnest attention of eminent political economists, and the system of co-operation is becoming popular in some manufacturing districts as a remedy for strikes. The war between labor and capital has been a long one, but it is evident that the bitterness heretofore existing is about to give way to more harmonious feelings between the laborer and the capitalist, but it is not likely that labor will ever occupy so high a position in its relationship to capital as has been promised by some philanthropists who profess to be laboring for the interests of the laboring classes. On the other hand, capital is entitled to a hearing in all matters of dispute and as neither can exist without the other it is sincerely to be hoped that the bitterness that has so long existed will soon give way to more harmonious feelings. In regard to strikes of railroad employes, it may be said that they are of a somewhat different character from those of other mechanics and laborers, in that they (the strikers) alone do not sustain the evil effects arising from them, but they are shared by the railroad community and the public at large. Indeed the railroad owners usually get the "lion's share" of the damage resulting from strikes. It does not seem that there should ever be any cause for strikes of railroad operatives; but such is the case, and it is somewhat remarkable that these occurrences have usually taken place on wealthy roads.

A careful review of this matter does not reflect greatly to the credit of the management of roads on which strikes have occurred. On the contrary the management has mainly been the aggressor. The average railroad employe will submit to many sore grievances before organizing any hostile movement against the corporation, and it is the persistent abuse of this virtue that finally forces the aggrieved party to adopt measures that are unpleasant, not to say ruinous, to the interests of the shareholder, and, to a considerable degree, damaging to the public. The history of strikes on the Erie road should be a sufficient reminder and serve as a warning to managers of other roads to remember that there is a limit to the endurance of operatives, bounded by justice and reason, and that it is dangerous to exceed these bounds. The last important strike of railroad operatives in this country is still fresh in the memory of most railroad men, and it is pretty certain that the owners of the road on which it occurred have not forgotten it. This was a strike of engineers, who had long submitted to great injustice at the hands of the managers who, instead of acceding to their reasonable demands, continued to add to their grievances from time to time until forbearance ceased to be a virtue. The point at issue was, that the company refused to advance the wages in proportion to the increase of duty, or to pay for extra labor, as was the rule on other roads. The engineers demanded no higher rates than was paid on other roads for similar service. Not only were their requests refused, but any one who dared to enter any complaint at headquarters was subjected to personal abuse, and in some instances it is asserted that the complainants were required to do double duty without increase of pay, as a penalty for their *impudence* in stating their grievances at the office. This was the state of affairs for a long time, but finally came the *strike*, and with it all the attendant evils. Locomotives were left at a certain hour throughout the entire line, and although in some cases a few firemen volunteered to "run," they were prevented by the engineers, who had determined that no former employe should be allowed to take the place of an engineer. Finally, the company, in their extremity, procured hack-drivers, saloon-keepers, carpenters, and men of all trades and professions, to act as engineers. The local press took sides with the company, and asserted that it did not require a great deal of skill to run a locomotive; and, although break-downs, collisions and disasters of every conceivable shape were the order of the day, the papers announced and asserted that the road was getting along as well as ever. Thus affairs continued for a few weeks, when it was stated by a reliable journal that the damage to rolling-stock, caused by being in the hands of incompetent persons, had reached the sum of $250,000, and was daily increasing. This state of affairs continued until not a locomotive on the line was in a running condition. Matters finally took a turn for the better, and although the road is now in a prosperous condition, the wound is not entirely healed, nor will it be for a long time to come. This is a fair sample of the result of most strikes of railroad operatives, and the causes which lead to them, although there may have been instances of the kind when the employes were unreasonable in their demands. It sometimes happens that the employes of an entire line become dissatisfied and exhibit a bitterness of feeling toward the managing officers for what they consider the abuse or ill usage of a single person. Now it should be borne in mind by these operatives that it is necessary for the managers of a railroad to enforce discipline, and it is often the case that men who have held responsible positions for years, and always been faithful in the discharge of their duties become reckless and neglectful, and a proper regard for safety demands their dismissal. How often do we hear of accidents at misplaced switches, the result of carelessness of "a faithful man "who has been in the employ of the company for "years." Thus the dismissal of men who have long had the confidence of the officers is sometimes unavoidable, and it is often an unpleasant duty to perform, but discipline *must* be enforced on a railroad or it cannot be operated successfully. It is well known that men become careless after years of duty in any one calling, even careless of their own lives. We frequently read of men who have been accustomed to the use of firearms all their lives and finally destroy themselves or others by a careless handling of weapons. Men who have worked at circular saws for years, and have been noted as remarkably careful, have at last, by a careless movement, been killed or maimed for life. A locomotive engineer who had run on one road for twelve years without accident, and who was always selected from thirty others of his calling to perform duties requiring great skill and care, finally fell into habits of carelessness which so grew upon him that he was regarded as unsafe and was discharged. The latest great smash-up of which we have

any account in the dailies was the result of carelessness on the part of an old and faithful watchman, who was the last man on the road who would have been thought capable of being guilty of such gross carelessness. Although this was, no doubt, one of those cases of oversight or forgetfulness that sometimes occur and which can hardly be accounted for; yet there is no experienced railroad man but can readily recall to mind instances of careful and trustworthy men falling into habits of forgetfulness or carelessness, rendering them wholly unfit for any responsible position. The dismissal of such men has sometimes caused trouble, and in such cases the employes are deserving of the severest censure. It is no excuse that the offending party is a member of a "protective union;" it is not for subordinates to say who shall be retained in the service of the company.

Another source of trouble in railway management is the habit some superintendents have of discharging first-class men without sufficient reason. Almost any trifling affair is sufficient to cause the discharge of competent and trustworthy men from some roads, and this is the secret why many roads are always in trouble. "Good men" can usually find employment where they are well used and where their rights are respected, while others, who are incompetent, will endure all manner of ill-usage rather than leave a situation they could not obtain elsewhere. But in regard to the latter question, we shall not see a better state of things until employers and employed establish the rule to ask for nothing but what is right and submit to nothing that is wrong.

Railroad Earnings for October, and from January 1 to November.

The reports of October earnings received from several of the oldest and best known lines of railroad are not particularly favorable—for instance the Illinois Central shows a decrease of $52,235, Chicago & Alton a decrease of $20,445, and Milwaukee & St. Paul a decrease of $131,789, and all of these roads are working a greater mileage than in 1869. On the other side, the Ohio & Mississippi shows an increase of $27,143, and Toledo, Wabash & Western an increase of $28,925. Among the several companies whose stocks are less prominent in the market, the Central Pacific shows an increase of $225,158, Pacific of Missouri $12,130, St. Louis & Iron Mountain $33,198, and other various differences seen in the table below.

Many of our readers who have been accustomed to watch with interest the monthly compilation of railroad earnings in the *Chronicle*, will be much surprised to find that no report for last month is made of either the Chicago & Northwestern or the Chicago & Rock Island roads, and it will probably be learned with regret that these prominent companies, whose stocks are such favorites at the board, will no longer be able to give to the public their usual reports of weekly and monthly earnings, in consequence of the arrangement recently made for the consolidation of certain earnings, by the Burlington & Quincy, Rock Island and Northwestern roads. It is to be hoped, hower, that the monthly statements will be published as soon as they can be ascertained, although they may be several weeks later than usual. There was a time when the monthly earnings of New York Central, Hudson River, Erie, Reading, Michigan Southern, Fort Wayne, Cleveland & Pittsburgh, and other roads, were regularly given to the public, but that would seem to the stock operator of the present day to have been a golden age of railroad information, and that we are, in this respect, rapidly approaching the dark ages, for railroad directors now certainly "love darkness rather than light," we trust not for the same reason which was formerly alleged of those similarly inclined. It is undoubtedly an advantage to parties who have control of the affairs of a railroad to have an exclusive knowledge of its financial situation, and the amount of its earnings from month to month; they have thus an opportunity for dealing in the stock with a certainty of profit which no outsider can possibly obtain. But on the other hand, it is against the common law theory for a corporation, which is supposed to be the mere creature of legislation, and to be responsible to the government for all its operations, to conduct its affairs privately, concealed not only from the public but from its own stockholders. Suppose that a party owning a hundred shares of the stock of one of these companies applies at its office for information as to the present status of *his* property particularly as to its earnings and expenses, what reply would he get? Merely a polite refusal; and what his shares are worth from time to time it is impossible for him to find out.

The immense growth of railroad corporations during the last few years, through consolidations, extensions and completion of entirely new lines, with stocks and bonds outstanding, amounting in some cases to $100,000,000, has proved more fully than ever before the necessity that they should be responsible to the public, from whom their whole profits are derived, and by whom their right to exist at all is granted.

The right of a legislature to call for reports at stated periods from its banks, insurance companies, savings institutions, &c., is fully exercised, and there seems to be every reason why the same practice should be extended to railroad companies, and we would still advocate, as we have previously done, the plan that a financial statement should be required of every railroad company once a month, or at least once a quarter, showing the amount of stocks and bonds outstanding, the earnings and expenses for the previous month or quarter, and any other facts which might be necessary to show the real condition of the corporation's affairs.

EARNINGS FOR THE MONTH OF OCTOBER.

	1870.	1869.	Inc.	Dec.
Central Pacific	$804,800	$579,642	$225,158	$....
Chicago & Alton	468,212	488,658	....	20,446
Clevl'd, Col., Cin. & Ind.	339,239	306,764	32,475	....
Illinois Central	862,171	914,406	....	52,235
Kansas Pacific	343,337	281,331	62,006	....
Marietta & Cincinnati	153,531	132,869	20,662	....
Milwaukee & St. Paul	908,313	1,040,102	....	....
North Missouri	235,240	235,513	....	131,789
Ohio & Mississippi	355,187	328,044	27,143	273
Pacific of Missouri	341,373	329,343	12,130	....
St. Louis & Iron Mount'n.	127,069	93,871	33,198	....
St Louis, Alton & T. H.	*157,986	204,552	....	46,566
Toledo, Wabash & West'n	451,393	422,368	28,925	....
Union Pacific	†667,981	1,057,382	....	389,401
Total	$6,315,682	$6,414,695	$441,697	$640,709

*Fourth week estimated.
†Approximate statement—complete figures probably much larger.

For the ten months of the year which have now expired the showings of most of the roads included in the table below compare favorably with the same period last year. Taking into consideration the increased mileage on several of the principal roads there is not a very material variation in their traffic, either increase or decrease. Without any knowledge as to the expenses, a statement of gross earnings is, at best, only an uncertain quantity from which to form an estimate of the net profits; earnings and expenses should both be given. In the remarkable statement lately issued from the office of the Chicago & Northwestern Company for the first four months of the fiscal year from June 1 to October 1, a decrease in gross earnings is shown of $92,181; a saving in operating expenses of $567,106; and a consequent increase in *net earnings* of $474,924. If other companies can make similar reductions in their expenses, the necessity of a statement of operating expenses is clearly apparent.

EARNINGS FROM JANUARY 1 TO NOVEMBER 1.

	1870.	1869.	Inc.	Dec.
Central Pacific	$6,947,507	4,666,333	$2,281,274	....
Chicago & Alton	3,993,233	3,960,208	33,025	....
Cl'vl'd, Col., Cin. & Ind.	2,675,691	2,598,599	77,092	....
Illinois Central	7,254,270	7,310,709	....	56,439
Kansas Pacific	2,717,568	....	....	....
Marietta & Cincinnati	1,133,470	1,150,174	....	16,704
Milwaukee & St. Paul	6,099,655	5,850,751	248,904	....
North Missouri	2,310,927	1,572,321	738,506	....
Ohio & Mississippi	2,521,610	2,362,623	158,987	....
Pacific of Missouri	2,883,940	2,614,366	269,574	....
Toledo, Wabash & W'n	3,620,488	3,494,675	125,813	....
Union Pacific	6,416,208	....	....	....
Total	$48,544,567	....	....	....
Total excluding roads not reported last year	$39,440,791	$35,580,759	$3,933,175	$73,134

—*Commercial and Financial Chronicle.*

The Canadian Canal Commissioners.

The following gentlemen are appointed to the Canal Commission of Ontario: Messrs. C. S. Gzowski, Toronto; D. D. Calvin, of Kingston, of the firm of Calvin & Breeck, owners of one of the largest fleet of steamers oe the lakes, and who is thoroughly conversant with the lake and canal trade; and George Laidlaw, of Toronto, who has proved himself well up in all that belongs to the trade of the Dominion.

Quebec is represented by Hugh Allan, of Montreal; Pierre Garneau, Mayor of Quebec, and President of the Gulf Port Steamship Company.

For Novia Scotia, Hon. Wm. Stairs, of Halifax, for many years an enterprising merchant of that city.

New Brunswick is represented by Mr. A. Jardine, an extensive merchant of St. Johns, and a large importer of Ontario produce.

Mr. Samuel Keefer, of Brockville, is the Secretary of the Commission.

They will meet on the 24th inst., and, I understand that their attention will be chiefly directed to the following works: The enlargement of the Welland Canal; the deepening of the St. Lawrence rapids; the deepening of the St. Lawrence river between Montreal and Quebec; the improvement of the Rideau Canal and the development of trade through it; the construction of of the Sault Ste. Marie Canal between Lake Superior and Lake Huron; the construction of the Caughnaga Canal between the St. Lawrence and Lake Champlain; the improvement of the Richelieu & Lake Champlain line of canals; the completion of the Montreal and Lake Huron system of navigation *via* Ottawa and French river; the construction of the Georgian Bay Canal, connecting Lakes Huron and Ontario; the construction of a canal crossing the neck of land between the Bay of Quinte and Lake Ontario; and the construction of the Bay Verte Canal across the Isthmus dividing the Bay of Fundy from the Gulf of St. Lawrence.—*Correspondence Toronto Globe.*

A Telegraph "Line Master."

The following suggestion is made by a correspondent of the *Journal of the Telegraph:*

All railways have a road master whose duty it is to supervise the repairs, and is expected to know what repairs are needed and how to make them. If the man is competent to fill his position, hundreds of accidents and interruptions are prevented yearly. In the telegraphic system, as I have seen it, but few interruptions are anticipated. When a line cannot be worked any longer a repairer is sent out to fix it up and instructed to hurry back to the office to be ready to go out in case of trouble at some other point. I have had some experience in this matter, and am satisfied that if a competent line master was appointed to every three hundred miles of line and his limits so arranged that he could inspect it two or three times a week, the efficiency of the wires would be greatly increased, and two-thirds of the "grounds" and "crosses" which now so seriously interrupt the working of the lines could be prevented. Repairers are like other men; some are competent and industrious, while others are both incompetent and lazy; but if they are brought under the eye of a competent line master who could see them and their lines two or three times a week, their line, like the track of a railway, would always be in order, or it would be known who was to blame for it; while, as it is now, there is no telling. This department of telegraphing (the lines and batteries) is, I am glad to see, beginning to receive the attention it merits, and I venture to predict that in a few years the line master will be as indispensable a part of the telegraph system as the road master now is in the railway system.

An Engineering Conundrum.

A correspondent writes to the *Monthly Journal* of the Brotherhood of Locomotive Engineers the following questions, with their solution:

"Supposing your engine to be standing, with crank pins, on one side, on the forward center—say, for instance, the right hand side—and, desiring to move her ahead, you put the reverse lever in the forwardmost notch of the quadrant, and give her steam, at which end of right hand cylinder will she take steam?"

"But instead of wishing to move your engine ahead, you desire to move her backwards, and you put the reverse lever in the backmost notch of the quadrant, and give her steam, at which end of right-hand cylinder will steam now enter?"

It will be evident, on a moment's reflection, that steam must enter at the forward end of the cylinder, whether the reverse-lever is in forward or back motion; in other words, whether it is the design to move the engine ahead or backwards; for, as the crank is on the forward centre, and the piston at the full completion of the forward stroke if it shall now move at all, it must be towards the back end of the cylinder, for it certainly can go further ahead, and this result is the same when the driver is turned so as to carry the crank pin down, or in the contrary way, and carry it upwards; in both cases the crank pin equally recedes from its position on forward centre. Now, as it is evident that steam cannot enter the forward end of the cylinder, unless the forward steam port is open, it follows that that port is alike open whether we put the reverse-lever fully forward or entirely back. Therefore it is plain to be seen that the valve is in the same position whether we would move the engine ahead or backwards. Now the question arises, how can this be? How is it that the movement of the reverse-lever, through the whole length of the quandrant, has not changed the position of the valve? To answer this question it becomes necessary to look a little at the nature of the work done by the reverse-lever, and what it really effects. And this is all embraced in the declaration that it elevates and depresses the links. That is all. If the lever is thrown forward the links are lowered—if thrown back the links are raised; and that is the whole office of the reverse-lever. Then we are brought at once to examine the links to see if we can find an answer to our question as to the non-movement of the valve. And what then is the link? Briefly it is merely a device for instantaneously connecting the valves (through the rocker and its arms,) with the *go-ahead* and *go-back* eccentrics; or, more properly speaking, a device for instantaneously *changing* such connection from the one eccentric to the other. This is its chief office, and this was the object had in view in first applying it, but it was found it also served as a cut-off though this effect was incidental and did not enter into the original calculation in applying it, and, indeed, it was only after its introduction that this effect was perceived.

Canadian Railroad Legislation.

The *Canadian Monetary Times* gives the following summary of the railroad legislation which will be asked at the coming session of the Legislature of the Province of Ontario:

"Charters to construct the following new railroads will be solicited: 1st. A wooden or iron railway from Oakville or Bronte on Lake Ontario, through Milton to Guelph, with power to extend to Lake Huron, and: 2nd. From the town of Brockville to the village of Westport in the township of North Crosby. The Midland, Wellington, Grey & Bruce, and Canada Central railways will apply to the 'Assembled Wisdom'—the former for power to issue sufficient new bonds to redeem all outstanding bonds and securities, and an additional sum of £100,000 sterling, and the two latter companies for extension of time. The Wellington, Grey & Bruce want the time for the completion of their road extended, and the Central desires the time extended during which they will be entitled to certain grants of land. Considering the views of the Premier of Ontario, as shown by his speeches in the House of Commons last session, a lively fight may be expected when the question comes before the Local House. A rather curious notice appears from Edward, Eugene and Ernest Beaufort. These individuals want Legislative authority 'to keep a saloon for selling spirituous liquors at each of the stations of the Grand Trunk Railway in the Township of Cornwall in the County of Stormont, and in the Township of Augusta in the County of Grenville.' The Preference Bond-holders of the Welland Railway Company, will apply for power to wind up the affairs of the Company by the sale of the road, propellers, rolling stock, plant, and for such other measures of relief as shall be proper under the circumstances."

—The Boston & Albany Railroad employs a colored engineer, who is said to do his work faithfully and well.

BARON VON WEBER'S EXPERIMENTS ON THE STABILITY OF PERMANENT WAY.

(CONTINUED FROM PAGE 172.)

We now come to the researches made by Baron von Weber to determine the power of permanent way structures to resist forces tending to displace the entire system. Baron von Weber states that as the speed of trains was increased on German railways there was noticed a peculiar and dangerous displacement of the permanent way, this displacement taking place chiefly where trains pass from straight to curved portions of the line, or from curved portions to level and straight lengths over which they passed at an increased speed. It was also observed that the displacements at the first mentioned points—displacements which consisted in the shifting of the line towards the convex side of the curves—were caused principally by engines having long wheel bases and comparatively light loads on the leading wheels; while the displacement of the straight portions of the lines was due mainly to the action of powerful engines with short wheel bases and considerable overhang at each end. In this latter case the horizontal oscillations which produced the displacements were almost always found to arise from the effect of vertical impact due to a loose joint or some local settlement in the line, the engine being thus not merely caused to lurch heavily sideways but being also made to oscillate in a vertical plane, thus alternately relieving and increasing the loads on the leading and trailing wheels. Under these circumstances when the flange of the leading wheel struck the rail lateraly at the same time that the load on the latter was decreased by the momentary relief of the leading wheel from a portion of weight it ought to carry, there was a greater displacement than there otherwise would have been, owing to the diminished friction between the permanent way structure and its foundation. Both the classes of displacements to which we have referred were found to be less in permanent way structures possessing considerable vertical rigidity than in those of a more flexible character.

It would be impossible to determine theoretically with any degree of accuracy the amounts of the forces brought to bear upon the permanent way in the manner of which we have just spoken; and until Baron von Weber undertook his researches there do not appear to have been any attempts made to ascertain by experiment what these forces really are, nor what powers of resistance a permanent way structure, taken as a whole, can oppose to them. In fact, when the subject was discussed at a meeting of German railway engineers, held at Munich in 1868, no account of any experimental researches bearing on the matter could be brought forward, and it was this that led Baron von Weber to carry out his investigations, his experiments referring, 1st, to ascertaining the resistance of permanent way structures to forces tending to produce horizontal displacements of the entire system; and 2nd, to ascertain the resistance of such structures to the loosening of the rails from the sleepers. For the present we shall confine ourselves to giving an account of experiments belonging to the first group, leaving the second group for future consideration.

EXPERIMENTS ON THE POWER OF PERMANENT WAY STRUCTURES TO RESIST HORIZONTAL DISPLACEMENTS OF THE ENTIRE SYSTEM.

These experiments were made to obtain answers to the five following questions:

(*a*) What is the resistance offered by a well-bedded sleeper of average size against lateral displacement in the ballast?

(*b*) What is the resistance of the whole structure against displacement at one point, and what is the influence of the ballast and bedding, on and in which the structure rests, upon this resistance?

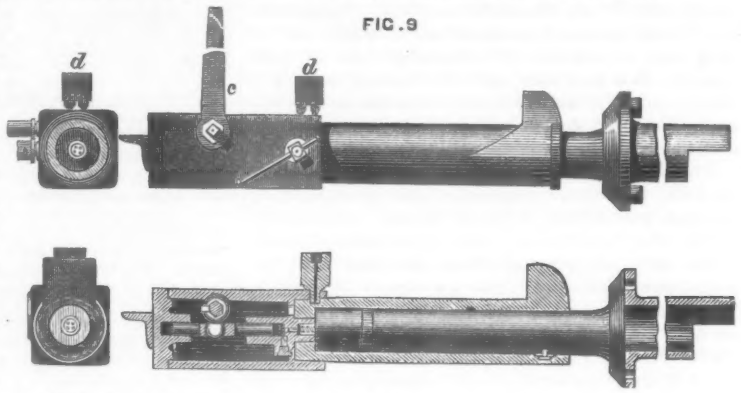
(*c*) How far does the filling against the ends of the sleepers increase this resistance?

(*d*) To what extent is the resistance to lateral displacement increased by the load on the structure?

(*e*) How far does the application of piles or stones, &c., increase this resistance?

The experiments to determine these points were carried out in the following manner:—A small hydraulic press of the form shown by Fig. 9, made by Messrs. Tangye, of Birmingham, was placed so as to abut against a fixed object, such as a wall or piece of rock, while the plunger was made to act against the head of the sleeper of the structure to be examined. This form of press is very convenient for such experiments, as the lever *c* can be readily moved in whatever position the press is placed, and the pressures applied can be easily ascertained by a pressure gauge screwed into the socket, *d*. The lifting powers of the press used by Baron von Weber, calculated from the diameter of the plunger and the pressures indicated by the pressure gauge, were verified by trying the press against direct weights, and the scale of the pressure gauge was then arranged in accordance with the indications thus afforded, so that it showed the thrust in centners (a centner = 113.436 lb. English) which was being exerted by the press. The section of the rails used for the permanent way tested is shown half size by Fig. 9 *a*. The rails were 18 ft. long and rested on six andseven fir sleepers 8 ft. long, 6 in. thick, and between 8 in. and 10 in. wide, the edges being slightly rounded. The experiments made with reference to questions (*a*) and (*b*) were as follows:

FIG. 9.

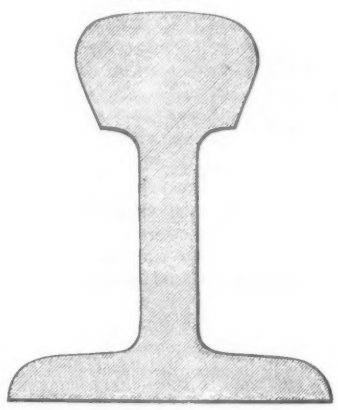


1st Series of Experiments. The spikes, by which the rails were fixed to sleepers bedded in different kinds of ballast, were drawn out, and the sleepers were shifted in the ground in the direction of their length, the ballast being packed against the ends up to the top surface of the sleepers. The average pressure required to displace each sleeper was:

	centners.	English lb.
For sleepers bedded in solid sand	9¾	1,106
" " " " compact broken granite ballast	10	1,134

It was found that after a sleeper was once displaced the force required for its further displacement was half that which had been required to start it, and for overcoming the adhesion between the sleeper and the ground. The nature of the bedding it was found had no appreciable influence on the force required for the displacement of unloaded sleepers.

FIG. 9.*a*



2nd Series of Experiments. In these experiments the press acted against the ends of the joint sleepers of a permanent way with suspended fish-joints, the rails being 18 ft. in length, supported by seven sleepers and the spikes being firmly driven in. The results were as follows:

PRESSURE APPLIED.	DISPLACEMENT.			
	Sleepers bedded in sand.		Sleepers bedded in coarse gravel ballast.	
centners English lbs.	millimetres.	inches.	millimetres.	inches.
40 = 4,537	—	—	1.5	0.059
50 = 5,672	1.5	0.059	—	—
60 = 6,806	—	—	3.0	0.118
65 = 7,373	3.0	0.118	—	—
70 = 7,940	—	—	4.5	0.177
80 = 9,075	4.5	0.177	6.2	0.244
90 = 10,210	6.2	0.244	—	—
100 = 11,344	12.5	0.492	9.0	0.354
105 = 11,910	Further displacement without increased pressure.		12.5	0.492
110 = 12,478			Further displacement without increased pressure.	

The displacements without increase of pressure continued until they amounted to 2 in. and 3 in., when irregular strains began to be set up in the structure itself, which required greater pressures to overcome them. Baron von Weber did not consider it necessary to ascertain what these greater pressures would have amounted to, as a lateral displacement of over 2 in. is beyond the limit worth investigating. In the case of the sleepers bedded in sand the displacement of 50 millimetres (2 in.) decreased on the pressure being removed to 15 millimetres, while in the case of the other structure the permanent displacement after the removal of the pressure amounted to 28 millimetres.

3rd Series of Experiments. In this case the hydraulic press acted against the joint sleeper of a structure having fished-joints not suspended, the dimensions being the same as in the preceding experiments. The results were as follows:

Pressure applied. centners. lb.	Displacement of sleepers bedded in gravel ballast. millimetres. in.
50 = 5,673	1.5 = 0.059
70 = 7,940	3.0 = 0.118
80 = 9,075	4.5 = 0.177
85 = 9,642	9 0 = 0.354
90 = 10,209	from 12 to 50 = 0.47 to 2.0

without increase of pressure.

The maximum displacement diminished to 25 millimetres (=1 in.) on the removal of the pressure.

4th Series of Experiments. In this series the press was made to act successively against the central sleeper of three different rails situated at three different points in a newly laid road. The sleepers were firmly bedded in coarse sand, and the results were as follows:

Pressure applied. centners lb.	Displacement. 1st sleeper. mil.	in.	2nd sleeper. mil.	in.	3d sleeper. mil.	in.
10 = 1,134	—	.....	1.5 =	0.059	1.5 =	0.059
20 = 2,269	1.5 =	0.059	3.0 =	0.118	3.0 =	0.118
25 = 2,836	—	.....	6.0 =	0.236	6.0 =	0.236
30 = 3,403	3.0 =	0.118	9.0 =	0.354	—	
35 = 3,970	—	.....	18.0 =	0.709	—	
40 = 4,537	—	.....	24.0 =	0.945	21.0 =	0.827
45 = 5,105	18.0 =	0.709	30.0 =	1.181	39.0 =	1.535
50 = 5,672	—	.....	39.0 =	1.535	42.9 =	1.655
55 = 6,239	21.0 =	0.826	48.0 =	1.889	48.0 =	1.889
60 = 6,806	24.0 =	0.945	60.0 =	2.362	60.0 =	2.352
65 = 7,373	33.0 =	1.299	—	.....	—	
70 = 7,940	60.0 =	2.362	—	.....	—	
Displacement remaining on removal of pressure.	35.0 =	1.417	39.0 =	1.535	42.0 =	1.653

5th Series of Experiments. The conditions in this series of experiments were the same as those of the fourth series, with the exception that the two sleepers on which the experiments now under consideration were made, were bedded in solid old broken granite ballast. The ballast surrounded the sleepers with great firmness, and it was so hard that it could only be removed with a pick. These experiments were made for the purpose of comparing with Series IV., and showing in a decisive manner whether the nature of the bedding and of the ground has any important influence on the resistance to lateral displacement. The results were as follows:

Pressure applied centners. lb.	Displacement. 1st sleeper mil.	in.	2nd sleeper. mil.	in.
10 = 1,134	0.8 =	0.031	1 5 =	0.059
20 = 2,269	2 3 =	0.905	3.0 =	0.118
30 = 3,403	3.8 =	0.149	4.5 =	0.177
40 = 4,537	4.5 =	0.177	6.9 =	0.236
50 = 5,672	5.3 =	0.208	12.0 =	0.472
60 = 6,806	18.0 =	0.709	18.0 =	0.709
65 = 7,373	60.0 =	2.36	48.0 =	1.889
68 = 7,714	— =	—	60.0 =	2.36

As Baron von Weber says, it will be seen from the above results that as long as the permanent way structure is without load, the influence of the nature of the ground and bedding upon the lateral stability of the structure is insignificant, the resistance to shifting being practically overcome by a pressure of 40 centners, or, say, about 2 tons in the case of sleepers bedded in ordinary ballast; and by a pressure of about 50 centners, or, say, 2½ tons in the case of sleepers firmly bedded in broken granite ballast of the most compact kind.

The deductions to be made from the experiments referring to questions (*a*) and (*b*), Baron von Weber considers to be as follows: 1. The resistance of unloaded well-bedded permanent way structures is comparatively small, a lateral pressure of from 30 to 50 centners being sufficient to break the connection between a sleeper and the ground. This pressure is less than that which would be exerted by the centrifugal force due to the passage of a 25-ton locomotive through a curve of 1,000 feet radius at a speed of 30 miles per hour, supposing that this centrifugal force was not counteracted by super-elevation of the exterior rail. 2. The nature of the ballast in which the sleepers of unloaded permanent way structures are bedded, has no important influence on the resistance to lateral displacement. 3. The pressure requisite for producing the horizontal displacement of an unloaded structure increases until this displacement has reached a certain amount, generally between 12 and 18 millimetres (from 0.472 in. to 0.708 in.), when the further displacement up to 50 to 75 millime-

tres (2 in. to 3 in.) is produced without any considerable augmentation in the pressure, until finally a considerable tension is set up in the different parts of the structure.

Experiments relating to question (*c.*) For ascertaining the influence of filling or ramming sand, ballast, or broken stone, against the ends of the sleepers, upon the resistance to displacement, but two series of experiments were made; the results of these being so striking that it was considered that no further investigations were required.

6th Series of Experiments. These experiments were made under the same conditions as Series IV., except that whereas in the latter case the sleepers were so bedded in the ground that the ballast was level with their upper surfaces, in this sixth series of experiments the filling at the ends of the sleepers for two lengths of rails was dug away. The results were as follows:

Pressure applied centners. lb.	Displacement. millimetres. in.
10 = 1,134	1.5 = 0. 59
20 = 2,269	3.0 = 0.118
25 = 2,836	12.0 = 0.472
35 = 3,970	48.0 = 1.889
45 = 5,105	60.0 = 2.36

When the pressure was taken off the displacement diminished to 6 millimetres (0.236 in.)

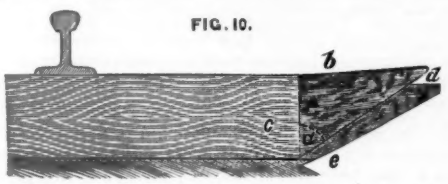
7th Series of Experiments. This series was made for the purpose of comparison with the fifth series; and the sleepers being bedded in exceedingly hard ground it appeared as if the filling against the ends would considerably increase the resistance. This filling having being dug away from the ends of the sleepers for the engths of two rails the following results were obtained:

Pressure applied. centners. lb.	Displacement. millimetres. in.
10 = 1,134	0.8 = 0.031
20 = 2,269	1.5 = 0.059
30 = 3,403	3.0 = 0.118
40 = 4,537	6.0 = 0.236
50 = 5,672	9.0 = 0.354
60 = 6,806	18.0 = 0.709
65 = 7,373	36.0 = 1.417
68 = 7,714	60.0 = 2.36

The displacement remaining after the pressure had been removed was 45 millimetres (=1.77 in.), and permanent displacemnt commenced under a pressure of 60 centners, or about 3 tons.

It was observed, in making experiments with sleepers having the ballast filled against their ends, that in each case during the displacement there was shifted a wedge-shaped piece of ground having a height equal to the depth of the sleeper, an angle at the point *a* (see Fig 10), varying according to the nature of the ground,

FIG. 10.



a width equal to the width of the sleeper, and a side, *b*, in no case longer than twice the depth of the sleeper. If the displacement of the structure was continued after the breaking away of this wedge, the sleeper ascended—more or less, according to the nature of the ground—the inclined plane, *e d*, the whole structure thus assuming an inclined position.

Baron von Weber's conclusions from the experiments referring to question (*c*) are as follows: 1. That the filling of ballast against the ends of the sleepers, up to the top surface of the latter, has an insignificant influence upon the resisting power of the structure to lateral displacement, particularly if the structure is unloaded, and if a one-stded tilting is possible. 2. That if the ballast is *not* filled against the ends of the sleepers, the elasticity of the rails will bring back the structure into its original position on the removal of the pressure, even after considerable displacement, as in this case small portions of ballast cannot fall between the end of the shifted seeeper and the undisturbed end filling, as is the case when the practice of filling up against the ends is followed.—*Engineering.*

[TO BE CONTINUED.]

Effect of Low Fares on Stocks.

Although there is constantly a clamor for the policy of low railway fares, and in a vast number of instances it is supported by results, the indications alike of shareholders and the public whenever the question is proposed to be brought to the practical test are usually such as to discourage directors from venturing upon it. For some time past on the Metropolitan Railway it had been found that between the stations where a reduction of fares had been put in force the weekly receipts presented a considerable increase on those of the corresponding week of a previous year, while between the stations at which the full rates had been upheld there was in nearly all cases either an absence of improvement or an actual falling off. The directors consequently resolved on a general adoption of the more successful tariff, but although under the circumstances this could not even be called an experiment, the mere announcement of the intention was followed by a decline in the price of the stock from 69 to 65—a reduction equal to about 6 per cent. on its money value. In any case it was to have been apprehended that during a few weeks until the change had become generally known to the population on the line an adverse effect must have been produced, but it seems that even already it has worked favorably. If the contrary had been the fact, although only for a short time, the board would probably have been reproached, and perhaps compelled prematurely to abandon the trial. Even as it is, they, together with their fellow-proprietors, have the mortification of seeing the value of their holdings seriously damaged, perhaps for some considerable time, by the prejudice of the investing classes against all movements based on the faith of moderate charges and a large demand.—*London Times.*

The "Pooling" of Railroad Receipts.

"We learn that the three lines which carry passengers between Chicago and Council Bluffs have made an agreement to pool the earnings on through business between these two places, and divide them equally." This modest little announcement, taken from a contemporary devoted to railroad interests, is deserving of more than a passing notice. It marks, indeed, the entrance upon a new stage of railroad development; whether for better or worse, remains to be seen. "Where combination is possible, competition is impossible." This aphorism, long ago enunciated, we believe by the elder Stephenson, is receiving new confirmation in this process of "pooling."

The last summer witnessed probably the most severe railroad "war" ever maintained between the leading trunk lines of this continent. It is greatly to be hoped that the public profited by it, for the railroads certainly have: though their lesson has perhaps been rich rather in experience than in money. The "war" broke out early in the season, and, as all business men know, rates between competing points tumbled down lower and lower, until they absolutely touched the zero point. For weeks cattle were drawn over the Erie and Central roads at a dollar a car on one line, in competition with a cent a head on the other. Fares and freights fell 50, 60 and 70 per cent., while the corporations seemed sternly bent on ruining each other. Considering who were the managers, or, rather, it might more correctly be said, the practical owners, of one of the competing lines, it is deeply to be regretted that they did not fight it out to the bitter end. No such good fortune could, however, reasonably be anticipated. One day in August it was intimated that the officials of the three great trunk lines were in conference, and on the next day competition ceased. A new tariff was then announced, the increased rates of which ranged between one hundred per cent. on first-class freight in general, and fifteen thousand per cent. (the rise being from $1 to $150 per car) on live stock in particular. The conferring managers, however, did not stop here; being together, and in the mood, they conferred to some purpose. Long experience had demonstrated both the folly of "cutting rates" and the certainty that rates under the existing system were sure periodically to be cut. The moment there is not a glut of business for all the lines, that one which is least busy attempts to underbid its competitors, and thus begins a "war." Some radical measure only could put a stop to this. "Pooling" receipts, as it is called, naturally suggested itself. This certainly went to the root of the difficulty. By virtue of this arrangement, all money received for business done by any road between points of competition was to be paid into a common fund, or "pool;" this sum was then subsequently to be divided in fixed proportions among the parties to the agreement. Such a plan certainly held out small inducements to "cutting." Any road indulging in the practice would have the privilege of doing all the work in order to divide the receipts. It would not improbably be allowed to wear itself out without remonstrance while thus earning dividends for other lines, which could afford in the meanwhile to lay their own cars up in ordinary. The arrangement involved, in fact, a practical consolidation of all the great East and West trunk lines, and the creation of a united interest which was to control in close alliance some 10,000 miles of track, and in the neighborhood of $600,000,000 of capital.

This certainly has an alarming sound. At the same time, we are not clear that, even for the public, the arrangement would not possess decided advantages. It would, in the first place, effectually dispose of the existing system of railroad competition, than which few things can be more mischievous. Stability—something which eliminates the gambling element and renders calculation possible—is the first essential of a sound business condition. What with paper money on the one side, and railroad competition on the other, it is not easy to see how any legitimate business has been conducted in this country during the last ten years; there have been about as many elements of chance in trade as would naturally be encountered at the faro table. Few people realise how largely unregulated competition has contributed to this result. For instance, two years ago buyers would not go to Boston because the competition in carriage was wholly to and from New York, and did not extend into New England. During the last six months it has been just the other way; Boston has been the focus of the sharpest competition, and merchandise has repeatedly left New York for the East in order to find the cheapest road to the West. So, again, of all points out of the line of competition. Certain railroad companies have, as a regular thing, carried goods a hundred or two miles further to a competing point for less than half of the amount they exacted for delivering the same article at the nearer point not touched by another road. Such a system of extortion is, of course, ruinous to local enterprise. It destroys all equality in chances. Anything, therefore, which replaced this wretched attempt at a law of supply and demand by an equable, regulated, and permanent system, could not be wholly bad. The combination suggested would at least establish a certain sort of responsibility—not the best, perhaps, but still better than nothing. Under the present system, no one can be held to any account; one line "cuts," or extorts, because another does it; a locality is ruined to-day and enriched to-morrow, simply because two or three men, over whom it has no real control, see fit to quarrel or be friends. No one controls; there is no defined objective against which public opinion can be directed—no one, in a word, is responsible. Now, in this country public opinion is the one thing which is all powerful. Once arouse it, once set it going in a given direction, and no man, or set of men—whether owning three millions of slaves, or ten thousand miles of railway, or three hundred millions of banking capital—can long stand against it. If you wish, therefore, to perpetuate abuses, the best way to do it in America is to divide responsibility. One man can be held responsible; one hundred, scarcely; a thousand, never. Thus, our executives are generally much purer than our legislatures; for the one man has to stand up before the people and answer for his acts, while the many hide themselves behind each other. So of our judiciary; where the executive appoints its members, more care is always exercised in selection than when the duty involves upon a caucus. What Governor ever would have put a Barnard or a McCunn upon the bench? Not improbably, then, it would prove far easier to produce beneficial results when acting on a recognized and responsible railroad combination, no matter how powerful or widely ramified, than on the disconnected members of an unorganized system, each one of whom disavows responsibility, and, indeed, disputes its existence.

While all this is true, it must at the same time be conceded that the power held by such a combination would be a very dangerous one; it would, in fact, have its fingers around the throat of our whole system of internal communication. It could exercise an influence over trade, and levy taxes in a manner scarcely within the power of the Government itself. The character of the individuals in whose hands such a control over our fortunes seems likely soon to centre, becomes, therefore, a matter of some interest. This aspect of the case, it must be confessed, is most uninviting. We do not like to resort to strong language, yet none other does justice to the occasion. Cornelius Vanderbilt, Jay Gould and J. Edgar Thomson—here is, indeed, a trio in whose hands an enlightened people are invited to confide most delicate interests! The contemplation of them in this new capacity certainly puts a heavy strain on the confidence one entertains in the future. * * * * * * Here they are, however, * * * * * * and the question is simply whether they can best be dealt with together or separately. We now incline to the opinion that the public could, on the whole, take them best together. Mr. Jay Gould and Mr. James Fisk, jr., have not hitherto been found very responsible parties; they have, however, been tolerated. They have made themselves popular through competition and reckless management; the public has felt that it could use them. Remove all this and then see how long they would last. Let them appear as part of a responsible and oppressive triumvirate, let them levy taxes and regulate trade, let them then abuse their power and make our people really feel their presence, and let us see how long Governor Hoffman, or "Tammany" Tweed, or Judge Barnard, could preserve them in place. Perhaps they might still hold their own, and new "Erie bills" would guarantee them a quiet possession; perhaps Vanderbilt and Thomson would enjoy the share of odium and danger which their associates in power would force them to incur; perhaps the West would appreciate and share the quiet subserviency evinced in the East; all these things may happen, but, though Issachar be a strong ass, yet even his back may be broken, when made to crouch between *three* burdens, and he will be far more likely to kick if he clearly sees a particular tormentor at whom his iron hoofs may be directed with effect.

It is useless, however, to theorize about that concerning which we are destined so soon to have a practical experience. The "pooling" arrangement, as regards the trunk lines, fell through at the September conference. It did so from no objection entertained towards it in any quarter, but because one individual whose concurrence was essential insisted upon including personal issues in the general settlement. It is delayed, not abandoned. The preliminary experiment of the system may be considered as now going on in the combination referred to at the beginning of this article. All the parties involved in this case are concerned in the other, and combination is now fairly on its trial as a substitute for competition. One thing may safely be predicted. This, at last, must inevitably carry the railroad and transportation problem to Washington. Congress must regulate commerce between the States, or it must go unregulated. A body more utterly unqualified for such a delicate task could hardly be conceived; but upon it the work must perforce devolve. The inevitable may not be avoided; but a future big with the result of an attempt on the part of the United States Congress to regulate and control our railroad triumvirs, is to the philosophic mind the reverse of assuring.—*The Nation.*

—The recent decision of the Supreme Court of Errors, at Norwich, is creating considerable interest. The decision was that railroad mortgage bonds of the Norwich & Worcester Railroad, made prior to 1862, must be paid in coin. This, of course, will affect all mortgages made before that time. We understand that the Savings Bank of Norwich holds about $300,000 worth of mortgages of this kind. More or less is held by all the savings banks.—*New Haven Register.*

—Arnold Walker, of Leslie, Mich., has been appointed Assistant Managing Director of the Jackson Lansing & Saginaw Railroad, with headquarters at Wenona.

Principles of Bridge Construction.

Notwithstanding the variety of forms which may be bestowed upon bridges, with all due regard to scientific designing and correct practical construction and the different principles embodied in each particular example, there are but two which can be considered to bear out the signification of the term in a pure and simple sense. They are the arch and the suspension principle. All other forms are either combinations or modifications of these in their outward shape or character of internal strain. The reason that the arch and suspension principles constitute alone perfect types of bridge construction is owing to the fact that they alone are acted upon by one description of strain, provided always that the conditions of theory are faithfully carried out in practice. There is a close analogy existing between the arch and suspension principle—in the difference between their relative shapes, or rather position, and in the difference between the nature of the strain exerted upon them under similar circumstances. The form of the one, and the character of the strain produced upon it, are exactly the inverse or opposite of those distinguishing the other, although the amount of each strain is identical. Obviously, for an entire structure, or any of its component parts, to be strained throughout by any single description of strain, is the most economical arrangement that can be devised. As the nature of the strain—whether tensile or compressive—varies with the principle adopted, the selection of one or the other, theoretically considered, will depend upon the limits of the relative resistances to the strains in question of the material of which the bridge is to be built. Practically, there are considerations which do not allow the dictates of theory to be followed universally in these instances. If we imagine an arch bridge to consist of a single vousoir or ring and a suspension of a single cord or chain, the subject of form and strain is reduced to its narrowest possible compass. In the comparisons of the strains upon these types of bridges—whatever may be their actual contours—they are assumed not to differ sensibly from an arc of a circle. It might be urged that the arch principle may be simplified by imagining the whole arch to be replaced by a couple of rafters or beams forming the chord lines of the half arches respectively and meeting at the centre. But a moment's reflection will point out that this substitution violates at once the simplicity of the system. A transverse strain is induced on the rafter, in addition to the thrust which results from the portion of the arch principle which enters into the design. A practical example of this arrangement is to be seen in the case of a roof of tolerably large span, in which no ties or secondary trusses, for some reason or other, can be introduced. Each rafter is thus a beam or girder sufficiently deep or strong to carry its own load. Its upper and lower flanges will undergo strains of opposite character, and their calculation, and that of those upon the web, will be determined on the assumption that the design is simply that of an inclined girder.

If we take the analogous arrangement in a suspension bridge, and suppose a couple of tie rods extending from the centre of the span to each tower, the original tensile strain upon the curved chain becomes complicated at once by the inevitable "sagging" of the straight ones. Long unsupported tie rods cannot be used in practice any more than unstiffened struts of similar dimensions. The range of the former very much exceeds that of the latter, owing to the different conditions of equilibrium which are produced in them by the action of their respective strains. If a strut be deflected from its normal position in which its longitudinal axis is in a straight line, the strain induced upon it tends to deflect it still further from that position. But if a tie be placed in similar circumstances the strain upon it will have a tendency to restore it to its original state of stable equilibrium. Until ties become of considerable length—as occurs in roof trusses, and in those examples of suspension bridges which are designed with straight rods—there is no necessity for stiffening or supporting them. It will be evident, from these considerations, that any attempt, however simple, to alter or modify the strict principle of the arch or suspension type of construction leads to a direct complication both of parts and strains. The integrity of the two systems is immediately destroyed, a variety of elements being introduced which are completely foreign to the designs, abstractedly regarded.

From these two principles have arisen the numerous combinations that constitute the present practice of bridge-building. All of these differ from the primitive types, in being acted upon by strains of tension and compression, either separately or conjointly. Of the compound forms which embody the principle of the arch in their construction, there are two, namely, the braced arch and the bow-string girder. The former of these has been used in but a very few instances, although it is, economically, a sound structure, especially for the employment of cast iron, as the arch itself, and the horizontal or upper member, are both in compression. A distinction must be made between a braced iron arch and an arched rib, in which the whole strain is taken by the rib. The new bridge at Blackfriars is an example of the latter type. It is true that the spandrels consist of a simple truss of bars, but they serve merely to transmit the vertical pressure to the rib, and do not act as bracing in the sense it is understood to imply when applied to braced girders of any description. There is, practically, no strain upon the horizontal member of an arched rib. It is nothing more than a stringer, and although it is absolutely necessary to the bridge, both as a stiffener and to form a support for the roadway, yet the real resistance is supplied by the rib underneath. The heavy spandrels, the stringer, and the quantity of cross bracing that must be introduced between each separate rib of a structure similar to that recently erected at Blackfriars, cause a bridge composed of wrought iron arched ribs to be anything, but an economical specimen of engineering. Another instance of the kind is the Victoria Bridge, carrying the London, Chatham & Dover Railway and other lines over the Thames at Pimlico. On the other hand, in the braced arch the horizontal upper number does its own share of duty, and the bracing acts according to the correct signification of the term. It is, in fact, a web just as in an ordinary lattice girder, and undergoes strains of compression, or tension, or of both contemporaneously, as the load is partial or uniform, statical or dynammical. The other principal modification of the arch form is the bowstring girder, which is exceedingly well adapted for bridges of large span. In this respect it is quite equal, economically considered, and possibly superior to the horizontal lattice, although for limited span the latter is preferable. The bowstring is the arch with the substitution of a horizontal tie for the lateral resistance of the abutments, and the addition of bracing between the bow and the tie or string. The theoretical curve for the bow for a mixed load lies between the parabola and the ellipse, but in practice an arc of a circle is the contour adhered to.

The chief reason that renders the bowstring girder an economical form to adopt in large bridges is that with a uniform load the strains upon the bracing or web are all of a tensile character. It will be suggested here that so long as the moving or maximum load is considerable this is no argument in favor of the system, as the bars in the web must be made strong enough to withstand the maximum compressive strains to which they can be exposed. This is just the point we are coming to, and it is here that the length of the span becomes a part of the question. The effect of any moving load upon a bridge, supposing that effect to consist of two components, weight and impact, or in other words of a statical and dynamical component, is proportional to the ratio existing between the insistent weight of the structure itself and the moving load. It is the old story of a man lying down with an anvil on his chest, and another man striking it with a hammer, which of course bore a very small proportion in point of absolute weight to the anvil. By similar reasoning, when the moving load bears a small proportion to the dead weight of the bridge, its impactive or dynamical component may be very nearly if not quite neglected, since the moving load per unit of length is a constant, while the weight of the bridge per same unit increases rapidly with an increase in the size of the span; the limit is not far distant when the effect of the impact may be omitted in the calculation. The moving load may thus be considered as a simple addition to the statical load, and the strains calculated accordingly. The bars will be subjected to compressive strains by a partial distribution of the load, but the proportions that have to be given to them by the exigencies of construction will frequently render them more than strong enough to support these without requiring counterbracing. So far as the bracing is concerned, the uniformly distributed load acts in direct opposite to the partially distributed moving load, and it is therefore readily perceived that in large bridges the size of the span may be reached, where the tensile strains due to the one completely nullify those of compression due to the other. While the bracing is thus relieved of a great portion of the strain which falls to the lot of its representative in the girder with parallel flanges, it must not be supposed that it is not resisted by some portion of the structure. It really falls upon the bow or upper flange, but from the shape of this member it is an easy and economical task to stiffen it against compressive strains compared with a long diagonal bar.

Returning to the suspension principle, the modifications of it have not been endowed with the success that has attended those of the other primitive type. Innumerable attempts have been made by engineers to construct a suspension bridge, simple or compound, which shall be available for railway traffic, but as yet they have all been failures, and in our opinion, always will. We do not mean to assert that it is not possible to build an iron suspension of a very complicated character, which will allow a train to pass over it at the rate of fifty or sixty miles per hour. But we do assert that to do this would cost infinitely more than to erect the bridge upon another and a more secure principle. The difficulty of imparting to a suspension bridge the requisite degree of rigidity, to permit of the passage of heavy loads at a great velocity, appears insurmountable. We have not space to mention the many different examples of this form, one of the most recent of which is the so-called cantilever bridges. These are nothing more than a spurious combination of a semi-suspension bridge and continuous girder, and are things to be avoided. They include all the disadvantages of both systems without any of their advantages. Many may be inclined to consider that the horizontal girder or girder with parallel flanges has a just claim to a title of its own as a primitive type of construction, as it is not derivable in form or theory from either of the two which has just been discussed. In this sense, perhaps, it might, but its liability to strains of a double character debar it from that privilege according to the rules already laid down. In whatever particular shape it may appear, whether as a tubular, box, plate, Warren, lattice, trellis, or trough girder, its flanges are both subjected to strains of a different nature, and its sides or web is placed in a similar position. Of these, the tubular may be regarded as obsolete. We shall never build, or at least we ought never to build, another Britannia Bridge. They are costly blunders. The same may be said of the box form, which is only the double plate upon a scale so small that it is impossible ever to examine the girder when it is once riveted up. The "Warren" has exploded for any but limited spans, and would never have enjoyed the share of favor it has, but for the circumstance that it admits of the web being connected to the flanges by pins instead of rivets, and thus offers facilities for erection in localities where skilled labor is scarce and expensive. Regarding the trellis in the light of a burlesque upon the scientifically constructed lattice, we find the latter form and the plate to be the sole representatives of the horizontal or parallel system. There are no varieties of the plate principle, except that the web may be either double or single. But there are many varieties of the lattice girder, in consequence of the different arrangements that may be made with the bracing. Some of these are both unscientific and uneconomical. The web is comparatively the important point in the lattice girder, although the flanges must receive their proper share of skilful treatment as well. An investigation of the merits of the different systems of bracing will form a subject for a future article.—*The Engineer.*

English Passenger Accommodations.

We printed a few weeks since an article from an English journal comparing the passenger accommodations of English and American railroads, in which the writer urged the adoption of some of the American peculiarities. We give below the comments of an American traveler who has fallen in love with the English accommodations. He is a correspondent of the Louisville, *Courier Journal*, and we have only to say of him that he seems more familiar with Southern than Northern passenger coaches and not very well acquainted with the accommodations now generally provided in first-class cars in the Northwest;

Our railroad system can be vastly benefited by an adoption of some of the improvements which England could lend us. Here the roads are built with the expectation of only paying three or four per cent. dividends, but they are made for one hundred years, and not for ten or twelve, as with us. These substantial constructions cannot, of course, be expected in sparsely populated and new countries. But the method of traveling can be adjusted with equal facility upon permanent or temporary roads. In America everybody is hurried together into a common receptacle, in which the fœtid breath of fifty persons, together with the fumes of tobacco juice freely squirted in every direction, and the odors of whisky, etc., etc., make a nauseous atmosphere, sufficient to stifle anybody with weak lungs. In one end of this long carriage you can be roasted by the heat of the stove, and your head split open with the headache from its dry air, whilst in the other portions you can freeze with cold during the winter. To those who like the hot, dry air it would be a great grievance for any other suffering passenger to open a window for a breath of fresh air, and a volley of growls and imprecations would salute the offender.

In England, and on the Continent everywhere, carriages are now built with compartments of four, six, eight, and sometimes more seats. They are commodious in first-class carriages, with elegantly arranged seats and backs cushioned with the best hair and springs. There is ample room for the largest-sized person, and no cramped position; for the legs can be stretched out without coming in contact with a hard wood frame, as is invariably the case in our railway carriages. I have slept as comfortably in one of these compartments as if I had been in a luxurious bed. Something similar has been adopted on the road from Boston to New York, and it is time that our Southern railway officials should wake up and do something for the comfort and convenience of the traveling public. The United States is a republic, but that does not necessitate the pitching in of everybody together the same as if they were pigs in a pen. A party of friends can insure not only comfort but privacy everywhere, and can so travel together as if in their own carriage. Trains are here made up of three classes—first, second and third. The speed is the same, but the accommodations are different. The first class, so immeasurably superior to anything we have (palace cars, etc., included), costs about 4½ cents per mile; third-class just half the amount.

Compare it with our prices and accommodations. With us, one is never secure from having a drunken man on the same seat, or a tobacco squirter flooding the floor beneath one's feet with his spittle, or something else disagreeable. There is no more objection to a man choosing his traveling society and paying higher for comforts, than there is in securing any other privilege that money commands. It would therefore be eminently appropriate for some of the roads centering in Louisvile to inaugurate a system similar to the one in vogue here. There should also be parties at every station to show passengers a seat, and not leave them to grope around hunting up one for themselves. No person is ever allowed to enter a train here when it is in motion; and in cases where injuries have ensued from violations of this rule, not only is there a lack of sympathy, but the offenders are prosecuted and fined $10. It would amply repay our railway officials to send some one to examine these points and put them in force in America.

—The United States Circuit Court, at Springfield, Ill., after argument of the case of the United States *vs.* John W. Burne, and after having fully considered the case, which was reserved for the purpose of careful examination, have, all the Judges concurring, sustained the following ruling of the Internal Revenue Bureau: Bonds issued by cities or towns to aid in the construction of railroads and to purchase stock therein, are not considered as issued by municipal officers in the exercise only of functions strictly belonging to them in their ordinary governmental and municipal capacity. They are held liable, therefore, to the stamp tax at the same rate as promissory notes, being five cents for every hundred dollars or fractional part thereof. The coupons are part of the bond, and do not require additional stamps.

General Railroad News.

OLD AND NEW ROADS.

Portland, Rutland, Oswego & Chicago.

At a recent meeting of the Portland & Rutland Railroad Company in Portland, there was submitted a copy of a fundamental contract of union to be entered into by the several companies in Maine, New Hampshire, Vermont and New York, between the city of Oswego, upon the navigable waters of Lake Ontario and the deep waters of Portland harbor, with communications from the several companies in New Hampshire, Vermont and New York, approving of the same, with the report of the survey just completed between Oswego and Fort Ann, showing a favorable line and easy grades by way of Booneville, Pisceo Lake, and Glen's Falls completing the chain of surveys between Oswego and Portland.

At this meeting it was voted to prepare a map of this route and a statement of the advantage and probable business of a railroad on it; and to invite local subscriptions so soon as the union shall be completed. The opinion was expressed that the proposed road should be constructed in the most permanent manner, with iron bridges and steel rails, and it was agreed that a call for a meeting for the organization of the company be issued as soon as the requisite amount of stock be subscribed and 5 per cent. paid on it.

Piqua, St. Mary's & Celina.

It is proposed to construct this road, the route of which we described last week, on a narrow gauge, something like that of the Festiniog line in Wales. In this case it will be merely a level road, intended chiefly to bring business to Piqua from the country on the line.

Toledo, Ann Arbor & Northern.

This company's consolidation with the Baltimore & Ohio, Toledo & Michigan was prevented by the negative vote of $750,000 of stock held by A. L. Williams of Owosso, Mich., on which, it seems, only a very small percentage had been paid, and which had been taken for the sake of preventing and not forwarding the construction of the road. The case was brought into the courts, and an injunction has been procured whereby, the Ann Arbor *Argus* says, the $750,000 of stock subscribed for by A. L. Williams has been assigned by him and distributed by the Commissioners to Governor Felch, and Judge Cooley, of Ann Arbor, in trust for the company, to be assigned by such trustees to *bona fide* subscribers; another election has been called by the Commissioners; "and everything promises to run smoothly in the future, that is if the stockholders can elect a board of directors in whom they will have confidence, who can harmonize with themselves and who will give time, ability and energy to the work. Liberal subscriptions and a little confidence are in demand just now."

A correspondent writes from Ann Arbor to the Detroit *Tribune* as follows:

"The commissioners have issued notice for a stockholder's meeting for the election of directors, to be held iin this city, December 9. A committee of stockholders as been chosen to investigate the whole matter with care and at that meeting to nominate the permanent directors, who, no doubt, will be elected as they report. The decisions of this committee are to remain a profound secret until the meeting of the 9th when the $1,000,000 capital stock of the company will all be taken, and the books closed. There was a surplus of subscriptions to the amount of $150,000, south of this point for which no stock could be issued. At the coming meeting, the stock assigned by Mr. Williams will be turned over to the company, $150,000 of it transferred to subscribers between here and the State line, and the rest probably cancelled. Enough available stock is taken to grade and tie the road from here to Toledo, the contracts for which will be let as soon as possible after the election of directors."

Burlington & Southwestern.

This road is to be in operation to Farmington, 22 miles west of Fort Madison, where the road begins, by the 1st of Sanuary or soon after.

Indianapolis & St. Louis.

This company has had an important suit pending in the Coles county (Ill.) Circuit Court, involving its title to depot grounds in Mattoon, Ill., worth $60,000. The decision was given on the 16th inst. in favor of the company.

Burlington to Kansas.

Arrangements have been made whereby close connections are made by trains which run through from Burlington, Iowa, over the Burlington & Missouri River Railroad and its Nebraska City Branch to Hamburg, with trains on the Kansas City, St. Joseph & Council Bluffs Railroad at that point for St. Joseph, Leavenworth and Kansas City, and all points in Southern Nebraska, Western Missouri and Kansas. By this route passengers from Burlington reach St. Joseph in 18 hours, Leavenworth in 21, and Kansas City in 22 hours. It is said that soon cars will run through from Burlington to Kansas City by this route. Their line to Kansas is likely to have a good patronage from Northwestern Illinois and Iowa, from which there is a considerable immigration to Kansas. At present a car for Hamburg is attached both to the morning and evening train from Burlington.

Omaha & Southwestern.

Delegates from Kansas have conferred with the officers of the above company concerning the extension of the road from Lincoln southward to and down the Big Blue river to Manhattan, Kansas, on the Kansas Pacific, which is 118 miles west of Kansas City, and 20 miles northeast of Junction City. The route is about 115 miles long. It is proposed to make a connection with the Missouri, Kansas & Texas Railway, so as to complete a line from Omaha to the gulf.

Northern Pacific.

Twenty-five miles of iron have been laid west from the Junction at the Dalles of the St. Louis and 56 miles of grading are completed. The following contracts have been let for grading the rest of the line to the Mississippi river:

	No. Miles.
Jno. & Gilbert Graham	7½
Charles Smith	2
Smith & Gould	15
D. S. Balch & Co	12

F. E. Canda has the contract for building the bridge across the the Mississippi, and the bridges, trestle work, piling, &c., along the whole line.

From the Mississippi River, westward, the following contracts are let:

	No. Miles.
Allen & Bishop (about completed)	20
Scully & Naylor (about completed)	5
Rose & Van Buren	6
Bruce & Thompson	4

And from Otter Tail west to Red River:

	No. Miles.
G. M. C. Brackett & Co	25
T. M. Ault	5
Jamison & Robb	15
G. M. C. Brackett & Co	12
W. C. Vaughn	45

The Minneapolis *Tribune* says:

"At the close of this month one hundred miles of grading will be finished, and forty miles of track laid.

"There are parties of engineers at work constantly between the Red River and the Missouri, making surveys, profiles and locations, and from the Pacific Ocean westward the great work is being mapped preparatory to construction.

"The most remarkable feature of work on the Northern Pacific Railroad will be that it will not cease all winter. The contract calls for the completion of the road by July 1, and there is little doubt, judging from the rapidity of construction thus far, that the road will be finished within the contract time."

Louisiana & Missouri River.

On the 14th inst. the bids tor grading 143 miles of the road, between Kansas City and the west line of Audrian county, were opened. There were one hundred and forty-six bids from seventy-nine different firms. We quote from the Louisiana *Journal*:

"Among the prominent bidders whose names we were able to learn, were Messrs. Shehan & Loler, St. Louis; Messrs. Geo. W. Gates & Co., Independence; Messrs. Forbis & Hughes, Independence; Messrs. J. Shelby & Co., Lexington, Mo.; Messrs. A D. Windser & Co., Lexington, Mo.; Messrs. Haynes & Forbes and Messrs. Trisler & Co., Macon City; Gen. E. S. McCook & Co., Illinois; J. W. McIntosh & Co., N. S. Hall & Co., Lexington; Henry & Co., Joliet, Ill.; Perry & Co., Chicago; Wm. Shepherd, Jerseyville; James Gowen, Chicago; Shirley & Co., Stanton, Ill.; Richard Cavanaugh & Co., Lexington, Mo.; R. C. Cushion & Co., Des Moines, Iowa; D. Hunkins & Co., St. Louis; Fitzgerald & Wolf, Iowa; J. H. Pauley & Co., Ill.

"There were several other St. Louis bidders and several from Chicago, whose names we did not learn.

"Considerable time was taken up in comparing so many bids. There were bids for the entire line, and bids for counties and sections.

"The contract for the entire line, except Lafayette county, was awarded to Messrs. Shehan & Loler. That in Lafayette county to Gen. Jo. Shelby & Co. The contract with Shelby & Co. had not been closed yesterday at the time of going to press and we are informed that if they fail to take the work, it will be let to Shehan & Loler. The following are the bidders for building the bridges:

"The American Bridge Co., Chicago; L. L. Kelley, H. S. Hopkins & Co., Bishop, Eaton & Hannibal, M. S. Carter & Co., St. Louis; and D. Perry & Co., Chicago. The contract was awarded to H. S. Hopkins & Co., St. Louis, the same parties who put up the bridges between here and Mexico."

Norfolk & Edenton.

It is proposed to construct a railroad from Norfolk, Va., southwesterly to Edenton, N. C., passing for some miles through the Great Dismal Swamp.

North Carolina Railroad.

The question of leasing the road has been submitted to a committee of five of the stockholders, who are to report next January.

Painesville & Youngstown.

The certificate of incorporation of the Painesville & Youngstown Railroad Company was filed at the Ohio Secretary of State's office, on the 17th inst. The proposed road is to extend from a point in Painesville township, in Lake county, through the counties of Lake, Geauga, Trumbull and Mahoning, to the township of Youngstown, in the county last named. The capital stock is $2,000,000. The corporators are: Joseph M. Hurlburt, Homer H. Hine, Samuel Moody, Alvin L. Tinker, Samuel Matthews, Cornelius V. N. Kettridge, Wm. Markham.

Missouri & Mississippi River.

One mile of iron, commencing at West Quincy, was laid on the 17th inst., and the first locomotive and construction train was placed on the track. It is expected to finish the road to Canton, Mo., before the close of the year.

Winona Eastern Connection.

The work on this road is progressing rapidly. About 20 miles of track is laid, from the junction with the Milwaukee & St. Paul road to two miles beyond Trempealeau, leaving in the neighborhood of ten miles to be completed to Winona. So soon as the river freezes over at Winona and the ice becomes strong enough to hold a pile-driver, a temporary track will be laid across the river on piles, to be taken up again in the spring.

Dubuque, Bellevue & Mississippi.

The "River Railroad Construction Company" has taken charge of the letting of contracts on this road, and has sub-let the work to different parties as follows, beginning at Bellevue, working north, and each section representing a mile:

To Reiling & Finn, sections 1, 2, 3, 4, 5, and 6.
To David O'Rourke, sections 10 and 11.
To M. Dunn & Co., sections 12 and 13.
To A. McCann & Co., sections 14 and 15.
To M. Morgan, sections 16 and 17.
To Stewart & O'Connor, sections 18, 19, 20, and 21.
To Hays & O'Neil, section 22.
To M. J. Finn, piling whole line.
To J. G. Peterson, bridging the whole line.

These contracts complete the entire line from Bellevue to the point of intersection with the road running west, near the old Lorimer furnace.

Dubuque & Minnesota.

Work on the section between Dubuque and Turkey river, is being urged forward rapidly, and the profiles will soon be ready for letting the contracts from Turkey River to McGregor.

Keokuk to Nebraska City.

The Keokuk *Gate City* ventures the statement that the construction of this road will be commenced at an early day. The Iowa Railroad Contracting Company has been organized for building it. The general office of the contracting company is at Centreville, Iowa, and its officers are: Benj. E. Smith, President; Charles J. Pusey, Secretary; Andrew Carnessie, Treasurer.

Flint & Pere Marquette.

The track is laid to a point forty-eight miles beyond Saginaw, and semi-weekly trains are running over the newly-finished road. Messrs. Baker, Pratt & Co. have the contract for construction. These contractors have now at work eighty horses and about two hundred men, and will have ten miles additional completed by the 1st of December. The chopping, grading, bridging, &c., of the last thirteen miles of their contract will probably be finished by the 1st of March, and the road in operation by the 1st of June, 1871.

Peoria & Rock Island.

At the annual meeting of the directors last week, the engineer reported the grading entirely completed from Peoria to Princeville, with the exception of one light section. The bridges and trestles are all completed for four miles out of Peoria, and cross-ties distributed for several miles. The grading of the balance of the line is so nearly completed that the track-layers will not be delayed. The following is the estimated cost of completing the balance of the line ready for the track:

Earthwork	$32,000
Piling and foundation	16,000
Howe truss bridges over Spoon river and Indian creek	15,000
Trestles, stock guards and road crossings	45,000
Cross ties	23,000
Total	$131,000

Mr. Smith, who has the contract for ironing the road, has commenced his work at Peoria. By Decem-

ber 29th the work will also begin at the Rock Island end. The first cargo of iron has arrived at Peoria, and the balance will arrive as fast as it can be used. Mr. Smith stated that the whole line would be opened for travel by the first of next May.

Gilman, Clinton & Springfield.

The contract for furnishing 150,000 ties has been let to Messrs. R. B. Lawrence & Co., of Springfield, Ill.

Lawrence and Pleasant Hill.

The St. Louis *Journal of Commerce* says that the contract for building this road from Lawrence, Kansas, to Pleasant Hill, on the Pacific of Missouri, was let last week. It will be remembered that this road some time since passed under the control of the Pacific company, and it was reported that the route was permanently abandoned.

Kansas City & Memphis.

The survey of this line is being made under the superintendence of Mr. Mortimer, Chief Engineer of the company. The line will run from Kansas City south by east through Harrisonville, in Cass county; Butler, in Bates county; then through the north-east corner of Vernon county; down near the west line of Cedar county; through Greenville, in Dade county, to Springfield. Twenty miles of the road, from Springfield to the Dade county line, will soon be offered for the consideration of contractors.

Albia, Knoxville & Des Moines.

Work was begun lately on the line of this road at Albia, 25 miles west of Ottumwa on the Burlington & Missouri River road. The proposed route is nearly parallel to and but 12 or 15 miles distant from that of the Des Moines Valley road.

Fort Dodge & Minnesota.

The survey of the new railroad line from Wells, Minn., to Fort Dodge, Iowa, was completed on the 11th inst. The line runs three-fourths of a mile north of Clarion, crosses the Boone three miles south of Elk Grove, and ends two and a half miles up the Soldier Creek from Fort Dodge.

Des Moines, Boone & Northern.

The Montana (Iowa) *Democrat*, speaking of this proposed railroad, says: "There is now no doubt that the work will be prosecuted with vigor, and in a year, or probably even less, trains will be running from Des Moines to Webster City. It is intended to push the road up to Mankato, Minnesota, which point will be a prominent railroad centre in course of time."

Des Moines to Indianola.

About ten miles on this road, from Des Moines southward, is graded, and the contractor, Marcus Kavanagh, expects to have so much of the line as is in Polk county ready for the iron by the middle of December.

Holly, Wayne & Monroe.

The stockholders of the company met on the 17th and consummated a lease of their road-bed to the Flint & Pere Marquette Company for 99 years. The Detroit *Tribune* says:

"The contract proposes at once to turn over to the Flint & Pere Marquette Company the control of the road bed of the Holly, Wayne & Monroe line, and that the former shall proceed forthwith to complete the road, contracting to finish it by January 31, 1872. It is estimated that the construction of the road-bed and the securing of the right of way have already involved an expense of $160,000. The stockholders of the Holly, Wayne & Monroe propose to lease to the Flint & Pere Marquette Company the road-bed, bridges, etc., for 99 years, and also to pay to them $100,000 in cash, to be paid as the iron is laid down on the road, the whole amount to be paid by the time the line is completed from Holly to Monroe. The Flint & Pere Marquette Company are to place upon the road the requisite rolling stock, and to operate the road in connection with their own, and they are required to locate the machine shops of the road at Monroe, and to continue them there during the term of the lease.

"By the contract it is agreed by the Holly, Wayne & Monroe Company, as soon as the road is completed, to issue to the Flint & Pere Marquette Company paid-up stock to the amount of $275,000, and also to issue to said company the coupon bonds of the first corporation to the amount of $16,000 per mile, as each mile is built."

By this new line, when completed, the distance between Saginaw and Toledo will be 134 miles, being 20 miles from Toledo to Monroe, 63 miles from Monroe to Holly, and 51 miles by the Flint & Pere Marquette road from Holly to Saginaw.

Michigan Air Line.

One hundred and eighty tons of iron for the line arrived in Jackson, Mich., last week.

Southern Minnesota.

Trains are now running regularly from La Crosse to Wells, and the track is being rapidly extended northwestward, with the expectation of reaching Winnebago City by the 1st of December, beyond which no work will be done the present season. The running time between La Crosse and Wells is nine hours and twenty minutes, and the distance, 148 miles. The time card of the company gives the following stations and distances:

STATIONS.	MILES.	STATIONS.	MILES.
Winnebago City	0	Fountain	7
Delevan	7½	Isinours	5½
Lura	5	Lanesboro	5½
Wells	10	Whallan	6
Alden	10	Peterson	9
Albert Lea	10	Rushford	5
Oakland	14	Moner Creek	6½
Ramsey	7	Houston	5½
Brownsdale	5	Mound Prairie	6
Side Track	8½	Hokah	7
Grand Meadow	7½	Grand Crossing	5
Spring Valley	10	La Crosse	1
Free Soil	7		
Total			170½

Neither the company itself, nor its individual members or officers, are to have anything to do with the purchase of grain, or to be interested in the warehouses along the road, which are to be owned and controlled by private parties.

Shenandoah Valley Railroad.

By the charter for this road, which the Pennsylvania Company proposes to construct as a connection with the South and Southwest by way of the Virginia & Tennessee road at Salem or Big Springs, it has the right to extend from a point near Fincastle, some 20 miles northward of the proposed junction with Virginia & Tennessee road, in a southwesterly direction nearly parallel with and 20 or 30 miles from that road to some point in East Tennessee where good connections can be made. This will make it independent of the Virginia & Tennessee line, if it is thought proper to construct it.

St. Louis & Iron Mountain.

The importance of the transfer at Columbus has already been sufficiently demonstrated by the very large traffic which crosses at this point. On a single day last week 154 cars of freight came into St. Louis over this road from points south and southeast of Columbus.

Leavenworth, Lawrence &. Galveston.

The opening of this line to Humboldt was celebrated on the 22d inst. by an excursion from Kansas City. About six miles below Humboldt this road will make a connection with the Missouri, Kansas & Texas road, to which it will give the best outlet to Kansas City and the East, until its own line is completed.

Milwaukee & St. Paul.

A new station called Burke has just been established on the Watertown Division.

Milwaukee & Northern.

The first section of this new railroad, from Milwaukee to Cedarsburg, twenty miles, was completed last Saturday. The line has been surveyed to Green Bay, and the right of way acquired to Fox River.

Grand Trunk.

In reply to a charge that the Grand Trunk Railway is unsafe for travelers, a Montreal paper replies that "during the year not one death has occurred by accidents to trains or from any cause over which the company had control. The fatal accidents in all have been seventeen. Of these nine occurred from persons walking on the track, four from persons riding on the platforms of the cars against the rules of the company; and one each from passengers attempting to get on the train when in motion, child falling between the cars, horse backing up against the train, and man falling in front of the engine. Most of these accidents arose from the parties being under the influence of intoxicating liquors."

MECHANICS AND ENGINEERING.

Steam on Canals.

The Troy *Times* describes as follows a new application of steam to canal boat propulsion invented by Mr. Main, foreman of the Morgan Iron Works, New York:

"A few days since, the canal-boat George Barnard, fitted up as a propeller, arrived here from Nyack, and has been making a trial trip upon the Erie Canal—working very satisfactorily, and evidently promising the most complete reform in the matter of canal navigation. The boat itself is an old one of the ordinary build, the only novelty about it being the motive power by which it is propelled, and the manner of its application. The method devised in the Barnard to fulfill the conditions required, and to overcome the difficulties, is to arrange an ordinary screw propeller in a cavity or opening situated in the bow of the boat. The opening is tapering in shape, and terminates about 20 feet from the bow. The propeller is driven by a simple upright engine, 9 inches in diameter, with 12-inch stroke, which is supplied by steam from an upright boiler, 4 feet in diameter by 10 feet high, the boiler being fed by an upright steam pump, the whole being very compact and occupying a space on the floor of the boat only 10 by 4 feet, and, including water in the boiler, weighs only six tons. The opening for the screw reduces the displacement only six tons, so that the application of steam power reduces the carrying capacity only ten tons. The consumption of fuel will be one ton of coal in twenty-four hours.

"The boat can be handled by three hands, or four if running all night. The machinery only takes ten tons from the carrying capacity, and has been found to be thoroughly practicable in every respect, and can be applied with advantage to boats now running or to new ones, making them independent of towage, either on canal or river. Those who saw the Barnard at work believe that a new era is soon to dawn upon the commerce of our canals."

Platforms under Passenger Cars.

The proposition of Mr. Thornton, of Rollo, Mo., to hang sectional Platforms underneath the trucks of passenger cars, very near the track, for the prevention of dust and accident, which was illustrated in the October 1 number of the RAILROAD GAZETTE, is about to undergo a trial on the Indianapolis & St. Louis road. An entire train is being fitted up with this improvement and it is probable its merits will be fully tested.

Bessemer Steel Rails.

From Duluth we hear that the directors of the Northern Pacific Railroad have appropriated $500,000 to erect rolling mills at Duluth to manufacture Bessemer steel rails for the road.

Railroad Manufactures.

The Bessemer steel works of John A. Griswold & Co., are now very fully employed, turning out, according to the Albany *Argus*, fourteen heats, instead of twelve, in the twenty-four hours, being, on an average, seventy tons of steel a day.

Railroad Manufactures.

The rolling mills at San Francisco, which have been in operation two and a half years, used 400 tons of iron monthly, turning out 230 tons of finished iron of which 90 tons consist of rails. Besides railroad iron, they have been turning out car axles, spikes, shoe-shapes, and general railroad work.

The Knoxville (Tenn.) Iron Company recently shipped ten car loads of spikes to Mississippi.

The Cumberland *Alleghenian* says that the new rolling mill of the Baltimore & Ohio Railroad at that place is now almost ready for making railroad iron. Three trains of double geared rolls, driven by six engines, are nearly completed, and another large engine is in place, intended for driving two blowing machines for furnishing air to the several double puddling furnaces, each of which is furnished with two stacks seventy-five feet high. There are also eight heating furnaces in process of construction. The roof, extending over about five acres of ground, and covered with plates of iron, is in a forward stage, and railroad iron will be made in about ninety days from this time.

The Franklin Iron Works, of Reading, Pa., besides other machinery manufacture freight and coal cars. They have recently erected a car shop 80 by 96 feet, to replace one dstroyed by fire some two years ago. They have a capacity for turning out 25 cars per week, exclusive of the other branches of their business.

At the locomotive works in Manchester, during the year ending October 1st, the castings amounted to 2,200,000 pounds. It is said to be a day's work for a man, with an assistant, to make a driving wheel, the weight of which is 1,500 pounds, some times ranging as high as 1,800. At these works, one man has turned out his wheel a day for 774 successive working days.

The Indianapolis Rolling Mill is turning out railroad iron at the rate of about ninety tons per day.

The Diamond State Iron Company, whose shops are in Wilmington, Del., will soon be prepared to make hot-pressed nuts, railroad spikes, bolts, fish-joints, and other railroad supplies.

A spike mill has recently been established in Youngstown, Ohio.

Means Brothers, at Steubenville, Ohio, are manufacturing car wheels largely at their extensive foundry.

The property formerly known as the Lazaretto Furnace, situated at Canton, three miles east of Baltimore, has recently been converted into a stock company, bearing the name of the Stickney Iron Company. The furnace is producing sixty tons of charcoal iron per week, used for car wheels and malleable iron.

Boiler Inspections.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspection for the month of September, 1870:

"During the month, 334 visits of inspection have been made and 703 boilers examined—633 externally and 200 internally, while 89 have been tested by hydraulic pressure. Number of defects in all discovered, 374, of which 45 were regarded as dangerous. These

defects in detail are as follows: Furnaces out of shape, 11—1 dangerous. Fractures in all, 20—3 dangerous. Burned plates, 25—6 dangerous. Blistered plates, 32—4 dangerous. Cases of sediment and deposit, 73—2 dangerous. External corrosion, 22—3 dangerous. Incrustation and scale, 42—3 dangerous. Internal corrosion, 10—1 dangerous. Internal grooving, 4. Water-gauges out of order, 26—2 dangerous. Blow-out apparatus out of order, 4—1 dangerous. Safety-valves overloaded, 17—7 dangerous. Pressure-gauges out of order, 59—4 dangerous. Boilers without gauges. 2. Cases of deficiency of water, 5—1 dangerous. Broken braces and stays, 24—7 dangerous. Boilers condemned, 4. Among the pressure-gauges out of order were several in very bad condition, varying from +10 to —20. We have so often commented upon this difficulty, pointing out the cause and the remedy, that there is little more to be said. But we will say this, that whenever, for any reason, a steam gauge is suspected of being in bad condition, it ought to be at once compared with a gauge known to be correct. There are many cases of sediment and deposit and incrustation and scale. If these are not attended to, the boiler is liable to be injured from the plates around the fire being burned. Every boiler should have hand-holes, in abundance and in suitable places. In horizontal tubulars this is very important. Hand-holes should also be provided at each end, and the boilers should be so set that easy access to them may be had."

A New Mode of Fixing Railroad Bridges.

On Friday afternoon a party of engineers and scientific men, headed by Sir John Rennie, visited the works of Messrs. Campbell, Johnstone & Co.,' at Silvertown, to witness the exhibition of a new method of launching girders or bridges without scaffolding. The structure which formed the subject of the experiment was two sections, each 110 ft. in length, of a bridge which is to be thrown across the Ganges at Cawnpore, and which will carry, above, the rails of the Oude & Rohikund Railway, and below, a good substantial roadway for bullock trains or ordinary traffic. Without entering into details this bridge may be described (and the description will be generally understood by engineers) as a lattice tubular girder, the height over all being 10 ft. 8 in., and the bullock road 9 ft. wide by 8 ft. high. The bridge, when complete, will consist of twenty-three spans, each of 100 ft. in length, resting on cylindrical piers of brickwork, and the weight of materials in each span will be about 75 tons. The method hitherto adopted for launching girders or bridges of these dimensions has been simple haulage by means of chains and pulleys, which has been attended with great loss of power, delay and many other inconveniences. The mode adopted and devised by Campbell, Johnstone & Co. avoids the waste of power, has nothing to do with either chains or pulleys, and depends entirely upon direct propulsion. The bridge, or section of the bridge, having been built up on the shore, rests at each end upon a series of ten wheels, which are themselves supported by ten hydraulic rams, five on each side; the number may of course be diminished or increased according to the work to be performed—and to these wheels which play upon a rail beneath the bridge, there is fitted a worm and worm-wheel moved by a rachet brace, which is set in motion by five men on each side working handles up and down, like the pumpers at a fire-engine, who, as we saw on Friday, can propel 150 tons at the rate of nine inches in the minute, a speed which with a slight alteration in the machinery, will be increased to a foot. Of course, the exact method of dealing with each particular bridge must, to a certain extent, depend upon the special circumstances of the situation. In this instance a bridge of 2,530 ft., or close upon a half-mile in length, is to cross the Ganges in twenty-three spans of 110 ft. each. Every section (each including two spans) will be launched from the same shore, and will be driven across by the apparatus which we have described, and which will be moved from pier to pier as required. The bridge was designed by Mr. Heppel, C. E.

Peat Fuel in Locomotives.

Experiments have been made with peat prepared by a peculiar process, as fuel for locomotives, between Hartford, Conn., and Springfield, Mass. A passenger locomotive has been used for passenger, freight and switching duty with this fuel for forty days. The result is reported as follows in the *Iron Age*: "The locomotive 'C. F. Pond,' running the passenger express from Hartford to Springfield, and return, with a train of two, three, or four cars (as demanded)—distance from Hartford to Springfield, 26 miles; number of stops, 8; time (by card of railroad), 65 minutes; allowing 3 minutes per stop, is 24 minutes; leaving running speed for 26 miles, 41 minutes, or a rate of 38 miles per hour—has afforded, by average of some twenty-five trips, this result: The trip up and return, distance 52 miles. Peat fuel used for the whole trip, 2,620 lbs.; water evaporated, 2,331 gallons—or, reduced to pounds, say, 18,209 lbs.—which equals 6·95 lbs. of water, *cold*, evaporated by 1 lb. of peat fuel, the *average* pressure having been throughout the trials, 105 lbs. *per square inch*, or 7⅛ atmospheres. Under fair condition of track and good weather, a result was obtained of 7·75 lbs. of water for 1 lb. of peat burned. The above, if desired to be calculated by size of cylinders, diameter of driver, speed and pressure for distance run, will prove conclusively the above statement, showing, say, 139,890 cubic feet of steam, or 290 cubic feet of water (2,331 gallons), by consuming 2,620 lbs. of peat fuel."

The disadvantage of this fuel is that it is bulky and must be shoveled into the fire-box much more frequently than coal. On the other hand it contains no sulphur or phosphorus to deteriorate the iron of the fire-box, grate and flues; it makes no clinker on the grate, no incrusted soot in the flues, no ash in the smoke-box, and emits no sparks or coals from the smoke-stack. It is abundant generally throughout the country, and especially so in many parts of the West where there is neither wood or coal. If this fuel can be used, many Western railroads can very materially reduce the cost of running locomotives on their lines.

Railroad Manufactures.

It is stated that Vice President Colfax has connected himself with a company organized for the purpose of engaging in the manufacture of steel axles at South Bend. The business will be conducted upon a large scale, giving employment to at least four hundred men.

The Hocking Valley Car Company has just been organized in Columbus. The company is to carry on the business of mannfacturing cars for the transportation of coal, iron, and other freight on railroads, and all the business connected with the manufacture of such cars, &c. The capital stock is $100,000, in shares of $500. The corporators are Wm. McCrory, John G. Deshler, H. T. Chittenden, E. A. Fitch and Walstein Failing.

Progress of the St. Louis Bridge.

The great caisson within which the east abutment pier will be constructed is in place and the laying of masonry within it commenced on the 17th inst. The following is from the St. Louis *Republican* of the 20th:

"A considerable portion of the first course of the masonry is laid, and it is quite an interesting study to watch the process of operations. The blocks of limestone are generally of great size, but are handled with wonderful ease and quickness. The massive iron hooks are affixed to the blocks as they lie on the barge, the ends of the hooks fitting the holes prepared on both sides of each block, so that there is no danger of slipping.

"As great care is taken with these lower courses of masonry as with those destined to sustain the influences of the water and air. The stones are chosen and shaped with close attention to the requirements necessary, and are laid together so as to form a compact mass of rock-like solidity.

"As the caisson sinks deeper and deeper with the increasing weight of the masonry, much care is necessary to make the immersion uniform in all parts. Accurate soundings are taken around the caisson every fifteen minutes or so by Mr. McComas, Superintendent, and a level surface to the iron floor is preserved by adjusting the weight of the masonry, laying stone at such points as are necessary to create an equable downward pressure.

"At present everything is tight and dry in the caisson, the descent to the air-lock is only a few feet, and there are none of the gloomy horrors in the spacious shaft which those who visited the air chamber of the east pier, when near the rock, may remember. This caisson incorporates various improvements over the former ones used, which actual experience suggested. The leakages of air developed up to the present are trifling, and the caisson, in its general construction, gives evidence of having been thoroughly well devised and put together.

"The operations at the bridge are not all confined to the piers. The foundations of four of the approaches on this side of the river are laid and the piers are built up some distance from the surface of the ground. Up to the present they have been constructed of red Missouri granite, and in their facings and jointings are fine specimens of solid, compact masonry. The foundation of the fifth approach pier the site of which is in the line of the levee buildings, has not been laid yet, as the bridge company have not yet gained full title to the ground. In the approach pier nearest to the abutment, the work of laying the first course of Missouri sandstone has been commenced, and the light grayish white hue contrasts well with the purplish red tint of the granite. The sandstone will be laid from the same height of all these approach piers, and also in the "T" wall of the abutment. So that there will be harmony of color in the stone of the piers and regularity of outline, the abutments and river piers will be carried up with gray granite until the cornice is reached, which will project five feet. In laying the blocks of stone, particularly the exterior ones of the piers, great care is taken with the joints, they being made as close as possible. In several instances Captain Eads has caused the rejection of stone after they had been fitted to the masonry, on account of forming wide joints. Attention to these details is absolutely necessary to insure imperishable solidity. If joints are not made close the mortar works away in course of time, admits water, and the subsequent effect of frost causes displacement of the stones and general deterioration of the masonry."

ELECTIONS AND APPOINTMENTS.

—Pursuant to notice. a meeting was held on the 14th inst. at No. 31½ West Third street, in the office of the Cincinnati & Springfield Railroad Company, of the subscribers to the capital stock of the same, for the purpose of electing directors and duly organizing in accordance with law. There were 10,100 shares of fifty dollars each, voted for the following gentlemen for directors: Horace F. Clark, of New York, President of the Lake Shore & Michigan Southern Railway; James M. Marvin, of Saratoga Springs, a director in the New York Central Railroad; J. H. Devereux, of Cleveland, Vice President and Manager of the Lake Shore & Michigan Southern; Selah Chamberlain, of Cleveland; Oscar Townsend, of Cleveland, President of the Cleveland, Columbus, Cincinnati & Indianapolis Railroad; L. M. Hubby, of Cleveland; R. M. Shoemaker, Seth Evans, and J. M. Kinney, of Cincinnati.

The Board of Directors organized by electing R. M. Shoemaker President. and Murray Shoemaker was appointed Secretary.

—At the last annual meeting of stockholders of the Peoria & Rock Island Railroad Company, the following gentlemen were elected directors: W. R. Hamilton, W. H. Cruger, V. Dewein and H. T. Baldwin of Peoria, W. L. Wiley, of Galva, O. E. Page of Cambridge, S. F. Otman of Wyoming, R. R. Cable of Rock Island, and Wm. Dennison of Ohio. At a subsequent meeting of the directors, W. R. Hamilton was elected President; W. L. Wiley, Vice President; A. N. Wheeler, Treasurer; C. P. James, Secretary; and R. R. Cable, Superintendent.

—The annual meeting of the stockholders of the Muscatine, Tipton & Anamosa Railroad Company was held at Tipton, on the 9th inst. A new Board of Directors was elected as follows:

S. G. Stein, Jacob Butler, Abraham Smalley and L. H. Washburn, Muscatine; W. P. Wolf, J. H. Rothrock, J. Culbertson and H. C. Platt, of Tipton, and J. S. Stacey, of Anamosa.

The name of the company was extended by adding the words "and Minnesota" to it. S. G. Stein, of Muscatine was chosen President of the company, and with the Treasurer and Secretary, was authorized to issue bonds not to exceed $20,000 per mile to aid in securing the construction and equipment of the road.

—The stockholders of the Central Branch Union Pacific Railroad Company have re-elected the old board of directors with one exception, G. H. Palmer of New York being elected in place of James Wadsworth. R. M. Pomeroy of Boston has been re-elected President, and E. H. Nichols of New York, Treasurer.

—The Receivers of the Indianapolis, Cincinnati & Lafayette Railway have appointed O. F. Moore Superintendant at Cincinnati; H. L. Hall, Master of Transportation, &c., and Mr. Van Duser, Road Master.

—We learn that Mr. Howard E. Laing, who has had for some time a general ticket office in Peoria, and has had much experience both in freight and passenger business, has been appointed General Passenger Agent of the Peoria, Pekin & Jacksonville Railroad, with office at No. 32 Main street Peoria. Mr. Laing is thoroughly familiar with the duties which he will have to perform, his labor having been in the same field for some years. He is an excellent business man and a courteous gentleman, and the Peoria, Pekin & Jacksonville road, which is preparing to do a large through business hereafter, is to be congratulated on its selection. Mr. J. S. Cook remains General Ticket Agent and Mr. C. E. Austin General Freight Agent.

—The failure of the Northern Transportation Company was reported on the 22d instant, with liabilities of $400,000, and assets of $1,200,000. The indebtedness is chiefly to banks in Ogdensburg, Toledo and Detroit. They ask an extension of one, two and three years. The assets consist of canal-boats, steamships and other boats. It is thought that the extension will be granted.

RAILROAD GAZETTE

PUBLISHED EVERY SATURDAY.

CONTENTS.

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Editorial Announcements.

Correspondence.—We cordially invite the co-operation of the Railroad Public in affording us the material for a thorough and worthy Railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Inventions.—Those who wish to make their inventions known to railroad men can have them fully described in the RAILROAD GAZETTE, *if not previously published,* FREE OF CHARGE. *They are invited to send us drawings or models and specifications. When engravings are necessary the inventor is expected to furnish his own engravings or to pay for them.*

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Engineering and Mechanics.—Mr. M. N. Forney, Mechanical Engineer, whose office is at Room 7, No. 72 Broadway, New York, has been engaged as Associate Editor of this journal in charge of these departments. He is also authorized to act as our agent

Change in Rates.—On and after the 1st of January next, the price of subscription will be four dollars per year. Until that time, subscriptions will be received for periods not exceeding one year at the old rate—three dollars per year.

☞ *Our Prospectus and Business Notices will be found on the last page.*

COMPETITION IN TRANSPORTATION.

We re-produce on another page an article from *The Nation* on the "Pooling of Railroad Receipts," which indicates the effect that measures to prevent competition between railroad companies will have on many thoughtful minds. The article is very positive and not a little bitter in its tone—more so in *The Nation* than as we have given it; our omissions being certain charges of dishonesty and rapacity against prominent managers, which, *The Nation* itself has since said, could only be justified by the most positive evidence and were not justified in this case;—but it gives a view of the subject which is not, perhaps, a popular one, yet has long been taken by thoughtful men who have studied the subject of transportation and observed carefully all the effects of competition. Whatever may be the benefits of competition, *where competition is possible*, these benefits are almost always more than counterbalanced by grave evils which affect the community as well as the companies. These we have often referred to. The most obvious is the increase in the cost of conducting the business. Advertising costs something, armies of agents and liberal commissions to solicitors cost much—not unfrequently ten, fifteen or twenty per cent. of the amount paid by the company's customers. When a second road is constructed to do the work which another already existing can do, the traffic at once has to pay the interest on an additional capital, and the interest on the capital expended on a line is usually two-fifths and sometimes one-half of the receipts—that is from 40 to 50 per cent. of the cost of transportation. More than this, the operating expenses of two roads doing just the work which one might do as well are of course much larger than would be the expenses of one line if it had all the traffic. It would not require a long argument to convince a farmer that if he has just work enough for one pair of horses it will cost less to do it with one pair than with two. Not only will the money invested in the animals be wasted, but the cost of forage and of the laborer who feeds and drives them will be superfluous. So it is with railroads, precisely. It is true that there are few instances where two roads have been built exactly parallel and close together, so that one cannot serve any part of the country better than the other. It is perhaps unfortunate that there has not been some such instance—two roads with common termini and nowhere more than a few rods apart, without connnections or branches, and wholly dependent for their income on traffic which can be carried and procured equally well by each. Such an example would have demonstrated the effect of competition between railroads so unmistakably that fewer erroneous ideas would be prevalent concerning it.

To accept the effect of competition on one or two stations of a line as the general effect is to judge of a forest by a single tree, or to estimate a corn crop by a single ear. It is true that, under the prevailing system, when there are two lines from one station, rates from that point are reduced. It is rarely true, however, that by reason of competition rates to *all* stations are reduced; and when a tariff is adjusted at a low rate to one point, the manager whose duty it is to see that the company's income receives no detriment are compelled to make the rates to other stations higher than they would have been otherwise. This is almost universally the case. Stations A, B, C and D pay for station E's advantages in rates. This is undoubtedly an evil under the sun. It gives undue and unmerited advantages to certain localities, and it often condemns great natural advantages to neglect. But it is just what the community has encouraged and welcomed. Millions of dollars have been voted by towns and counties in the State of Illinois with the past eighteen months, largely—perhaps we might say chiefly—for the purpose of securing competition in transportation. Many of these lines will serve a good purpose by affording facilities for transportation in districts which needed them, but even many of these have come before their time, while others will reach scarcely any traffic which could not be carried nearly as well by some existing line.

In the great through lines, the evil of competition to the community is perhaps most evident in the great irregularity and uncertainty of rates, a point which *The Nation* discusses effectively. To many Western merchants doubtless this subject needs no explanation this year. They will not soon forget how the rival merchant who ordered his stock a few days earlier had scarcely one-half so much to pay for freight charges as they who ordered later. Where heavy goods are sold this has made a very great difference in the result of the season's business—all the difference, perhaps, between a satisfactory profit and a considerable loss. No satisfactory business can be done when so important an element as the cost of transportation is entirely uncertain and very fluctuating. Doubtless even those who have rejoiced most over the "freight war" of the past season will confess that a regular rate which would be an average of the very high and very low rates would be much more satisfactory. They should always remember that for every advantage they have at one time they must pay at another, *and with interest*. Owners of railroad property are like other men. They prefer a regular income, even if moderate, to an irregular one, though sometimes very large. Ten per cent. dividends four years and no dividend the fifth is just equivalent to eight per cent. each of the five years; yet most stockholders would much prefer the latter, and would even if the irregular dividend should occasionally rise to twelve per cent. Fort Wayne stocks with guaranteed seven per cent. dividends are in demand at 94, while Northwestern preferred, which frequently pays ten per cent. and seems likely to pay it frequently and before long regularly, can be had in large amounts for 90.

When the public claims that it is defended against exorbitant rates by competition, it should first ascertain for how much of the time competition is secured by the independence of trunk lines. The truth is that it does not often exist at all. For the most part rates to points reached by two or more lines are agreed upon by all the lines competing for the business. The competition effects only the expenses of the companies and not at all the rates paid by their customers. This it is very important to remember. For more than three-fourths of the time—perhaps nine-tenths—the rates are just what the competing companies have agreed upon, as likely, to pay their expenses, fair dividends, and any previous losses from competition, *plus* the expenses of a lively struggle with each other to obtain business. The difference, therefore, between the ordinary practice and that proposed by pooling receipts is, that in the latter case the public pays the price of transportation and in the former a considerable commission on that price in addition.

In conclusion we give the following as transportation axioms, which students of the subject should always bear in mind:

1. Railroads are supported by their customers.
2. To support two railroads costs more than to support one.
3. What a line loses by competition at one station other stations pay for.
4. What the community gains at one time by the low rates caused by competition it pays for afterwards with interest.

That there should be no check on railroad companies, we do not say nor believe; but that such a check can be maintained satisfactorily by competition, seems almost impossible. The governor which will regulate exactly, satisfactorily and justly the relations between the public and the railroad companies is yet to be invented. Above we have endeavored to show what it is not.

THE END OF THE RAILROAD WAR.

During the past week a conference of the representatives of the trunk lines between Chicago and New York was held in New York for the purpose of settling the difficulties between them concerning rates and speed of trains. The result of their consultation may be inferred from a telegram received by the passenger agents in this city, signed by J. N. McCullough, General Manager of the Pittsburgh, Fort Wayne & Chicago Railway; J. H. Devereux, General Manager of the Lake Shore & Michigan Southern, and H. E. Sargent, General Superintendent of the Michigan Central. This telegram directed them to sell tickets by their several lines at the following rates on and after Thursday last: Chicago to New York, $22; to Boston, $24; to Philadelphia, $20; to Baltimore and Washington, $19; to Harrisburg, $18.50; to Albany, $21; to Providence and Worcester, $23; to Springfield, Mass., $22.25.

The advance to Quincy, St. Louis, and other points in that direction is in the same proportion, but we cannot now give the exact figures.

It is also announced that one week from next Sunday, on the 3d of December, a winter time schedule will be adopted on all the roads, by which trains on all the lines will leave at the same time and arrive nearly at the same time, a slight advantage being allowed to the Fort Wayne and Pennsylvania line. The excessively fast time of 29 and 30 hours between New York and Chicago will be abandoned, we are very glad to say, and the fastest train, we believe, will make the trip in about 36 hours.

The leaving and arriving times at Chicago will be as follows: The fast train will leave at 9 a. m., the Atlantic express at 5:15 p. m., and the night express at 9 p. m. The early mail train will be managed as suits each line. By the Michigan Central it will probably leave at 5:30 a. m., and by the Fort Wayne at or near the present time, which is 6. a. m. Trains will arrive at 6:30 and 8 a. m., 7:45 and 8 p. m.

There have been rumors that at this meeting an arrangement would be made to "pool" the receipts from the through business and divide them between the lines in certain definite proportions to be determined by a comparison of the business of the different lines for some time past, just as is now done by the lines between Chicago and Omaha. An attempt to do this just failed of success last September. There are so many details to be settled, and so many conflicting interests to be harmonized, and, especially, so much faith in each other's good intentions required in such an arrangement as to make it difficult to carry out. We do not as yet know that it was even attempted at this week's conference.

It is not to be expected that the public will relish the news of this advance of rates. Every one must have known, however, that it was inevitable. Not one of the companies has been satisfied with the low rates which have ruled for the past six months. What the public should remember, however, is that the advance to $22 to New York, instead of some lower figure, is the direct consequence of the unusually low rates which have decreased the companies' earnings for half of the year. This loss is to be reimbursed. But for this we believe that the rate might have been less—very likely no more than $20, which has been the favorite figure with many of our Western passenger agents.

But though this rate might pay expenses and satisfactory dividends, it will not also pay for past losses. These, justly, are to be made up. What passengers did not fully pay for last summer they must pay for hereafter.

All which confirms certain views set forth elsewhere in these columns in an article on competition written before the news of the advance in rates had been received.

Wanted—An Invention.

Any person who is unfortunate enough to be obliged to travel at this season of the year could bear testimony to the fact that the usual manner of heating cars is a disgrace to modern civilization and a stigma on the intelligence of car builders. Not only is there no provision to supply an adequate amount of fresh air, but, owing to the careless or stupid way in which the stoves are often managed, the temperature in the car varies so much that passengers are alternately chilled until their teeth chatter and then heated almost beyond the point of human endurance.

The process is usually this: the fires are allowed to go down so low that some of the passengers complain of the cold to the person whose duty it is to attend to the stoves. Usually the only idea which persons filling that position seem to have of the object of ventilators to cars is, that they are intended to allow the heat to escape when it is too warm, and if it is too cold they should of course be closed. Whenever, therefore, complaint is made of the cold, the first thing which is done is to close up every aperture through which fresh air can enter or escape, and then make as big a fire as possible. The result if it has not been experienced can perhaps be faintly imagined. The atmosphere of the car gradually grows hotter and more stifling, and then more stifling and hotter, until perhaps some courageous sufferer will rebel and insist on having the windows or ventilators opened, and the draft of the stove closed. The car is thus cooled down to a temperature of chilliness, and the whole process is again repeated.

What is needed is a maximum and minimum thermometer of some kind which will show the highest and the lowest temperature to which passengers are subjected during each trip. The instrument should be arranged so that its index, of whatever form it may be, can be locked up and be out of the reach of the persons in charge of the stoves. The thermometer should record in some way the highest and the lowest temperature of the car. If it was examined at the end of each trip, and the brakeman or person who attended to the stoves were called to account for his carelessness, it would secure some sort of consideration for the comfort of passengers. Not only would it be necessary for him to give more attention to regulating the fires, but he would also be obliged to look after the ventilators and see that they were not all closed, otherwise the car would get too hot and his thermometer would make a record of it.

A word of caution to inventors. A contrivance of the kind we have suggested must be simple and should be cheap. An ordinary maximum thermometer would hardly answer, because the jar of the car would move the recording attachment. Some other device mus tbe used, and if it could be arranged so as to be seen of all men in the car, it would serve a good purpose. All complicated traps should be avoided, and inventors should thoroughly test what they design before they recommend it.

Death of Jarvis Williams.

We could be called upon to perform no sadder duty than we are in announcing the death of this gentleman, which took place in Boston on Saturday, November 12. For the past six or eight years he has been the Treasurer and General Manager of the Hinkley & Williams Locomotive Works, the business of which he conducted with extraordinary skill and energy. He was a native of Maine and for several years resided in Wabashaw, Minnesota. On his return to the East he re-organized the Hinkley & Drury Works under its present name. A few years ago he established the banking house of Jarvis Williams & Sons, of which he was the head.

It is seldom that a man so actively engaged with the cares and perplexities of business retains the kindness and gentleness of nature which were so characteristic of Mr. Williams even when most deeply absorbed with the responsibilities of his position. He was never too busy to give a word of sympathy, counsel or advice, or lend a helping hand to those who needed it. He was uniformly in his business relations prompt, enterprising and just; as a citizen he was public-spirited and liberal; and to all, frank, warm-hearted and sympathic. Those whom he employed can bear testimony that to them he was always a true friend. They and all who knew him will deeply mourn his death.

Among the Railroad Shops.

We have recently made several excursions to the railroad machine shops in Chicago, and spent a part of a day in Fort Wayne and another at Aurora. We find considerable activity in most of them, not only in keeping up repairs, but in building new locomotives, cars, etc. Most of the larger roads are now adopting the policy of employing a part of their men on new work, either constantly or else in dull times. In this way, it is said, the full force of men can be kept employed, and when they are needed for repairs it is not necessary to get new men. It is also said that the machinery built in this way has better material and workmanship than that which is bought. At any rate, be that as it may, the locomotives and cars which railroad companies build themselves seem to suit them better than those which they buy, which we suppose is the main consideration, after all.

THE ILLINOIS CENTRAL,

at the Weldon shops, in this city, has three new freight engines, Nos. 188, 189 and 190, in process of construction, under the direction of Mr. S. J. Hayes, Superintendent of Machinery. The company is now building about ten engines per year. The first one of the three referred to will be completed in December. They, and in fact all that have been built there for several years past, have been made from the same patterns and of uniform design. They are of the ordinary American plan, *i. e.*, have four driving wheels and four-wheeled trucks, and are intended for burning coal. The cylinders are 16x24 in., wheels 63 in. outside diameter, wagon top boilers with two domes. The boilers are made "telescopic," 47 in. outside diameter next the smoke box. The height of the wagon top above the barrel of the boiler is 10 in. The latter has 169 2-in. iron tubes put in with a copper ferules at the fire-box end. This plan of fastening tubes has been patented by Mr. Hayes. The fire-boxes are 60 in. long. The sides and back end are made of steel, the crown and tube sheets of Low Moor iron, all 5-16 in. thick. All the iron in the shell of the boiler is of the same thickness. The steel used is manufactured by Park Bros. and Hussey, Wells & Co, Pittsburgh. *All* the seams in the boilers are double riveted with ⅝ in. rivets. The distance apart of the two rows is 1⅜ in. from centre to centre, and the distance from centre to centre of the rivets, measuring in the same row, is 1¾ in. The fire-box has Hudson's shaking grates, with a solid drop door which dumps the coal outside the ash-pan.

The driving-wheels are spread 7 ft. 9 in. from centre to centre; the truck wheels 64 in., and they are 26 in. in diameter.

The throttle valve is inside the smoke-box, and the dry pipes take steam from each of the domes. The back dome has two of Anderson's safety valves. These valves are closed by volute springs which are inside the boiler, and therefore entirely out of the reach of engineers or others disposed to tamper with them.

The cylinders are attached to a wrought iron smoke-box, similar to the old Rogers plan.

The frames are planed and finished all over and are four inches wide through their whole length. The front bar is bolted to the back end.

The links are made of steel, skeleton pattern, with a radius of 4 ft. 9¾ in. The eccentrics have 5 in. throw. The steam ports are 15 in. long by 1 3-16 in. wide; exhaust pipes 2¼ in. wide; lap of valves outside, ¾ in., and 1-16 in. inside.

The exhaust nozzles are 2⅜ in. in diameter. The engines all have the improved smoke-stack (illustrated Vol. I., page 265 of the RAILROAD GAZETTE) designed and patented by Mr. George Holton, the Master Mechanic of the shops in Chicago. The Illinois Central Company, since 1861, when it first commenced building locomotives, has turned out thirty-three entirely new engines.

Besides the locomotives, Mr. Hayes is building two new snow plows, which are nearly completed. They are attached to an ordinary eight-wheeled platform car, and can easily be detached, so that the car can be used for other purposes at the seasons when it will not be required for removing snow.

Two iron powder cars are also nearly finished. The body of each car is 26 ft. long, 8 ft. 2 in. wide, and 6 ft. high. The sides are made of No. 14 iron and stiffened with angle iron. They are made convex, and swell out about 2 in. The bottom is made of No. 11 iron and is covered with 1¾ in. matched flooring. The sides are sheathed with ⅞ in. matched boards, which are carried about half way up. This is done to prevent the iron from coming in contact with any loose powder which might be scattered.

Mr. Holton is building for the shops a new cylinder boring machine from patterns and drawings received from the Grant Locomotive Works. These machines are not expensive and are very efficient in doing the work for which they are designed.

THE ILLINOIS CENTRAL CAR WORKS

are also quite busy. They have nearly completed, three new Post-Office cars, 45 ft. long, and 10 ft. wide. They are divided into three compartments, one for the express company, one for a distributing mail room, and the other for the through mail. The distributing room is in the centre of the car. They all have raised roofs with suitable ventilators and four-wheeled trucks with a swing motion. There are no doors in the end of the cars, as is usual, nor between the mail and express compartments. The only communication is by a narrow foot-board and hand-rail outside the car. The object of this is to exclude persons who have no business in these cars, and by making it difficult to gain access to the express and mail rooms, place an obstacle in the way of the commission of robberies, such as from time to time have been so successfully accomplished by overpowering the express and mail agents. All the compartments have doors on each side of the car.

The mail room has an attachment for catching mail bags while running. It is difficult to describe this so that its construction could be understood, without a drawing.

The cars are painted a dark yellow color, striped with black, and with very little ornament. Inside they are finished with black walnut.

Two new baggage cars, 45 feet long and 10 feet wide over the body, are also nearly completed. The roofs are round, or, more accurately, the rafters are semi-elliptical in form. These cars are made very strong and substantial.

Mr. Snow, the foreman of the car shop, is just sending out the last of nine "caboose" or "way" cars. They are 30 feet long over the bodies, and are built with a look-out on top, *i. e.*, the centre of the car is built up above the roof and has windows in front and behind. The cars are intended to be attached to freight trains, and have two seats inside elevated so high that the conductor or brakeman, from either of them, can see the whole length of the train. The proper day and night signals are attached to the look-out. The cars have stoves and a closet for the clothing of the train men. Obviously, their comfort has been considered in building the cars, a consideration too often lost sight of by railroad companies.

The Superintendent of Machinery, Mr. S. J. Hayes, has the general management of the Car Department of the Illinois Central Railroad, but the car shops are under the immediate jurisdiction of Mr. C. F. Scoville, who is the Master Mechanic of the car shops.

They are about to commence work on four new first-class passenger cars and two new sleeping cars for their St. Louis line.

Hereafter some account will be given of the work in the Aurora and Fort Wayne shops, and in other Chicago shops.

NEW PUBLICATIONS.

The Journal of the Telegraph closed its third volume with the number for the 15th instant. This is a semi-monthly quarto journal with, usually, 12 pages in each number. It is the organ of the Western Union Telegraph Company and is, we should say, indispensable to every officer and employe of that company, as through it all orders, announcements of changes in tariffs, extension of lines, establishment of rates, and changes in operators are made. At the same time it is not merely the organ of a company or a journal of news, but has scientific and practical articles on the art of telegraphy, both original and selected, which are of great value to all men in the profession who have any desire to understand their business or ambition to excel in it. The office is at No. 145 Broadway, New York, and the subscription price is one dollar a year.

The American Railway Times.—If we have neglected to notice formally this, one of the oldest and for many years decidedly the ablest and the most influential of American railroad periodicals, we have certainly given our readers an opportunity to know what its character and value are by our frequent selections. The *Railway Times* is not a journal of railroad news, but is more particularly devoted to railroad engineering and management. It is altogether independent and severely critical, denouncing in unmistakeable terms whatever it regards as abuses in management, and urging with persistence and ability many radical reforms in management.

The *Railway Times* has 16 quarto pages a little smaller than those of the RAILROAD GAZETTE and is published in Boston at $4 per year.

Van Nostrand's Engineering Magazine for November has the following contents: From *Engineering*, "Iron Arches," by W. Airy, "Sewage Purification," by A B C, "Historic Meteorology," "Indian Railways," "Metalline;" from the *Journal of Applied Chemistry*, "On Soluble Glass," and "Improved Method of Producing Hydrogen Gas," from the RAILROAD GAZETTE, "Principles of Tractive Power in Locomotives;" from *The Engineer*, "The Loss of the Captain," "Marine Engines," "Modern Fire Arms—the Martini-Henry Rifle," "Naval Gun Carriages;" from the *Mining Journal*, "The Metals and their Ores," "On Certain Proposed Improvements in the Manufacture of Hydro-Carbon Oils," "German Smelting Works," "Transfer of Power—Accumulative System;" from *Nature*, "The Natural Laws of Muscular Exertion," by Samuel Haughton, "Iron and Steel—a very Costly and Vexatious Fallacy," by W. Mattieu Williams; from *The Builder*, "Water Supply and Other Questions in India," "The Taj-Mahal at Agra," The Preservation and Purity of Iron." It has also the Report of the American Iron and Steel Association; "Rival Gun Carriages," from the London *Times;* from the *Mechanics' Magazine*, "Heating Buildings by Hot Water," "Breech-Loaders for England," "Improvements in Railway Construction," "The Practical Application of the Microscope," The Strasbourg Clock;" original articles, "Strains in Rafters," by S. H. Shreve, "Wrought Iron and Steel—the Fluo-Titanic Process; a translation from the *Revue Industrielle*, "Tests of Metallic Bridges," and from *Annales du Conservatoire*, of "Experiments with a Decentering Apparatus;" an article on the "Mineral Wealth of India," and an account of a "Visit to the Bessemer Works at Troy," Which Mr. R. W. Raymond contributed to the New York *Evening Post*. It has also several closely printed pages of "Notes" on iron and steel, railroads, engineering structures, etc., and is altogether a valuable number. That its selections are made to our taste is however quite evident from the fact that nearly all of those relating to railroads have already appeared in our columns.

Chicago Railroad News.

Locomotive Engineer's Ball.

Chicago Division, No. 96, of the Brotherhood of Locomotive Engineers, give their second annual ball at Metropolitan Hall, on Wednesday, December 21.

Pittsburgh, Cincinnati & St. Louis.

Last Sunday a change in time was made on this line. The day express now leaves at 7:40 a. m., instead of 8:10, as heretofore. It reaches Columbus at 3:00 a. m. the following night. The night express leaves at 7:10 p. m., instead 7:40, and makes its time to points in Ohio and Pennsylvania nearly as heretofore, being fifteen minutes later to Philadelphia and Pittsburgh, and half an hour later to New York.

The Cincinnati and Louisville trains leave at 7:40 a. m. and 7:40 p. m., reach Cincinnati at 10:10 p. m. and 9:35 a. m., and Louisville at 11:30 p. m., and 3:50 p. m.

The Lansing accommodation leaves at 3:40 p. m. and arrives at 10:55 a. m.

By the morning train the time to Cincinnati is 14¼ hours, to Louisville 16 hours; by the evening train the time to Cincinnati is 14 hours, and to Louisville 20 hours.

Pittsburgh, Fort Wayne & Chicago.

On this line the winter change of time was made last Sunday. The times of leaving Chicago are not greatly changed. The mail leaves at 6 in the morning instead of 5:50; the fast express leaves as heretofore at 11 a. m., but runs somewhat slower, arriving in Pittsburgh at 2:30 a. m. instead of 12:50, in Philadelphia at 2:10 p. m., instead of 12:20, and in New York at 5:06 p. m., instead of 3 p. m. Thus the time to New York is now 29 hours instead of 27 as heretofore—which is fast enough for winter, certainly.

The Pacific express has generally left earlier in winter than in summer, but this time its leaving time is made ten minutes later,—5:25 p. m. instead of 5:15. This is the chief difference, the arriving time in New York being but two minutes from the old time.

No change is made in the leaving time of the night express—9 o'clock p. m., but its speed is somewhat increased, so that it reaches Pittsburgh at 5:22 instead of 7:50 p. m., Philadelphia at 6:50 instead of 9:40 a. m., and New York at 10:30 a. m. instead of 1 p. m., as heretofore, lessening the time of the trip by two hours and a half.

By the trains as now run the times of running to New York are:

Fast train, leaving Chicago at 11 a. m.	29 hours.
Pacific express " " " 5:15 p. m.	37¼ "
Night " " " 9 "	37½ "

Thus the night train is seen to be just about equal in speed to the Pacific express, which has heretofore been the heaviest train. On all these lines cars run through to New York, and the passenger who has once secured a seat or a berth has secured it for the whole journey.

The following is a summary of the official report of that part of the line which is within the State of Ohio, made to Hon. George B. Wright, Commissioner of Railroads and Telegraphs in that State.

Total amount of capital stock (all paid in) $19,714,285.71; increase since June 30, 1869, $8,214,285.71; total funded debt, $13,663,000; floating debt, $18,329.62; decrease of floating debt since June 30, 1869, $79,863.05; total debt and stock, $33,395,505.33; total cost of entire road and equipment up to June 30, 1870, $24,685,255.20; proportion and cost of road and equipment to Ohio, $13,246,646.22; length of main line, 468 3-10 miles; length of branches, 35 miles; length of single track in Ohio, 251 3-10 miles; length of branches, 14 4-10 miles; sidings and other tracks, 68 3-10 miles; total length of track in Ohio, 334 miles.

There are on the roads in Ohio 40 wooden bridges, with aggregate length of 4,082 feet, and 8 iron bridges, with length of 629 feet. There are on the road 221 locomotives, 119 passenger cars 54 express and baggage cars, 3,334 freight cars, and 56 other cars.

There were carried during the year 1,857,949 passengers, at an average rate of 2 7-10 cents per mile, and 717,694 tons of through freight, and 910,622 tons of local freight, at an average rate of 1 6-10 cents per ton per mile.

There were consumed on the road in Ohio 24,310 cords of wood, and 71,075 tons of coal.

The earnings from transportation of passengers are $2,619,218.03; from freight $4,697,551.49, from mail $93,900; from express $132,141; from other sources $106,702.74. Total earnings $7,649,513.26. Total operating expenses for the year $4,325,906.61; net earnings $3,323,606.65.

Total receipts from all sources $7,694,513.26. Total operating expenses and all other payments $7,415,925.71. Balance $278,587.55.

There were killed during the year 33 horses, colts and mules, 31 bulls, oxen and steers, 130 cows and heifers, 5 calves, 9 hogs and 104 sheep.

During the year one passenger was killed, one employe and nine others. Total killed 11. Eighteen persons were injured.

Lake Shore & Michigan Southern.

This company has established a ticket office at the Northeast corner of Washington and Dearborn streets, where the new office of the Great Western Despatch is situated. Mr. J. E. Grant, who was formerly in the office at No. 39 Dearborn street, has charge of this office.

We give below the official report of this company for the year ending June 30, 1870, to Hon. George B. Wright, Commissioner of Railroads and Telegraphs for the State of Ohio. This report is for that part of the line in Ohio:

The Lake Shore & Michigan Southern Railway Company, with a line extending from Chicago, Illinois, to Erie, Pennsylvania, consolidated with the Buffalo & Erie Railroad Company, whose line extends from Erie, Pennsylvania, to Buffalo, New York, the new organization under the name of the Lake Shore & Michigan Southern Railway taking the assets and assuming the liabilities of the Buffalo & Erie Railroad Company.

October 1, 1869, leased the Kalamazoo & White Pigeon Railroad, 38 miles in perpetuity on assuming the payment of interest on its funded debt ($800,000), which is $44,000 per year, and buying the equipment at a valuation. At the same time the Kalamazoo, Allegan & Grand Rapids Railroad was leased (58 miles) on assuming the payment of interest on its funded debt ($840,000), which is $67,200 per year, also paying 6 per cent. per annum on its capital stock $610,000), which is $36,000 per year. The equipment was bought at a valuation. The two leases include the road from White Pigeon, Mich., to Grand Rapids, a distance of 96 miles. It has been worked as a branch of this road since October 1, 1869. Capital stock—common, $34,404,500; guaranteed, $533,500; Total, $34,938,000. Amount of stock per mile of road, $37,089; proportion of stock for Ohio, $12,276,459; funded debt, $22,001,000; floating, $890,507.56. Total debt, $22,891,507.56. Amount of debt per mile of road, $24,301. Total stock and debt, $57,829,507. Cost of road and equipment, $52,804,746.41; cost of road and equipment per mile, $56,056; length in miles of entire track (main lines and branches), 942¼; length of single main iron track in Ohio, 195; length of double main iron track in Ohio, 17½; length of branches in Ohio, 119; length of sidings, etc., in Ohio, 78. Total length of iron in Ohio, 409. Bridges in Ohio—wood, 31; iron, 5; stone, 9; wooden trestles, 37; number of locomotives, 274; number of passenger cars, 187; number of express and baggage cars, 63; number of freight cars, 5,551; number of other cars, 219; number of persons operating road in Ohio (about) 3,000.

Highest rate of speed per hour allowed: Passenger trains (in miles) 45; average rate, including stops, 30.

Rate of fare for passengers per mile (in cents):

	1st Class.	2d Class.	3d Class.
Highest rate for shortest distance	6½	2.3	1
Highest rate for more than 5 and less than 15	5	..	..
Highest rate more than 15 and less than 30	3.6	..	..
Highest rate more than 30 and less than 50	3.6	..	..
Highest rate more than 50 and less than 100	3.5	..	..
Highest rate for whole length main road in Ohio	3.2	..	..
Through rate	3	..	..

Freight rates per ton per mile (in cents):

	1st Class.	2d Class.	3d Class.	4th Class.	5th Class.
Highest rate for shortest distance	22	18	16	14	..
Highest rate more than 5 and less than 15	16	13	11	9	..
Highest rate more than 15 and less than 30	9	8	7	6	..
Highest rate more than 30 and less than 50	7	6	5	5	..
Highest rate more than 50 and less than 100	6	5	4	3.5	..
Highest rate for whole length main line, Ohio	5	3.5	3	3.5	..
Through freight	3.6	2.9	2.3	2.7	1

Number of passengers carried, 2,244,698; number tons freight carried, 3,016,346; cords of wood consumed, 216,950; tons coal consumed, 28,000.

Passenger earnings	$4,223,699 96
Freight earnings	8,097,145 45
Mail earnings	142,445 85
Express earnings	301,202 47
Other sources	223,830 80
Total earnings	$12,988,324 53
Operating expenses	7,996,249 15
Net earnings	$4,992,075 38

Accidents in Ohio—Persons killed, 10; persons injured, 20.

Animals killed: Horses, 4; cows, 35; heifers, 13; steers, 8; sow, 1; colts, 5; bull, 1; oxen, 7; calves, 2; sheep, 9; hog, 1.

The American Merchants' Union Express Company runs on the road between Buffalo and Cleveland, and pays $198.40 per day for 24,000 lbs. of freights west and 8,000 east, at 62c per 100 lbs. excess (through) and 30c (way).

The United States Express Company runs between Cleveland and Chicago, and pays $312.50 per day for 20,000 lbs. through freight, $1.25 per 100 lbs. through excess and 60c way excess.

On the branches there are special rates. This road is ballasted with gravel and all fenced.

Freights Eastward.

On the 22d inst. the following rates went into effect: To New York, first class, $1.60 per hundred; second class, $1.25; third class, 85 cents; fourth class, 60; dressed hogs and fresh beef (at owner's risk), 90; cured meats, 70; grain in bulk, 60; flour and meal, per barrel, $1.20. To Boston rates are ten cents higher on first and second class, fresh meat and flour, and five cents on the other descriptions. The changes are on fourth class, cured meats and grain, which are five cents higher, and on flour, which is ten cents higher than by the previous tariff.

Michigan Central.

Beginning with next Sunday this company will have two daily trains to Cincinnati, running over its line 56 miles to Michigan City, thence over the Louisville, New Albany & Chicago Railroad south to Lafayette, 90 miles, and thence by the Indianapolis, Cincinnati & Lafayette Railroad directly to Cincinnati by way of Indianapolis, 179 miles. Thus the entire length of this line is 325 miles. It has the advantage of an excellent entrance into Cincinnati, and also of passing through Indianapolis. Its merits, however, are well known, as it was long a favorite route. By the new arrangement a train will leave the Central Depot in Chicago at 9:30 a. m., with cars through to Cincinnati. At 6:15 p. m. a train will leave with Pullman sleeping cars for both Cincinnati and Louisville. Close connections will be made at Cincinnati for Baltimore and Washington, and at Louisville for Memphis, New Orleans, Mobile, Nashville, Chattanooga, Atlanta, Pensacola, Savannah and other Southern and Southeastern cities.

Next Monday, also, it is expected that trains will begin running on the northern division of the Chicago & Michigan Lake Shore Railroad in connection with the Michigan Central's Grand River Valley Division. The present northern terminus of the road is at Whitehall, 16 miles north of Muskegon. It connects with the Detroit & Milwaukee at Nunica, a few miles east of Grand Haven and 22 miles west of Grand Rapids. The trains will run over the Detroit & Milwaukee from Nunica to Grand Rapids, and the entire route will therefore be 54 miles. There will be one train a day, leaving Whitehall at 8 a. m. and reaching Grand Rapids at 11 a. m., in time to take the afternoon train to Detroit on the Grand River Valley Division. This line will be in charge of Mr. Bush, Superintendent of that division.

Personal.

Henry W. Hubbell, late ticket agent of the Chicago, Burlington & Quincy Railroad at the Chicago depot, died last Sunday at his home in Aurora of consumption.

Chicago & Northwestern.

Some slight changes in the running time on the Galena Division took effect last Sunday. The Iowa passenger now leaves at 10:15 p. m. instead of 9:15; the Pacific express at 10:45 a. m. instead of 10:30; and the Clinton passenger at 8:30 a. m. instead of 8:15. The Freeport passenger arrives at 2:30 a. m. instead of 3:00; the Pacific express at 4:15 p. m. instead of 3:50; and the Clinton passenger at 6:45 p. m., five minutes earlier than formerly.

The winter time-table for the other divisions of the road, which is to take effect to-morrow, is not yet announced.

Chicago & Alton.

The extension from Wenona to Washington is completed and will probably be opened for business next Monday. Tracklaying is commenced on the Lacon Branch, which will probably be completed in a week or two.

Chicago, Rock Island & Pacific.

The following changes in the time table were made last Sunday: The Peru accommodation leaves at 4:30 p. m. instead of 5:00, and arrives at 9:45 a. m., five minutes earlier than before; the Atlantic express arrives at 4:15 p. m., instead of 3:35; and the Night express at 7 a. m. instead of 6.

REGISTER OF EARNINGS.

FOR THE FIRST WEEK IN NOVEMBER.

Michigan Central (284 miles), 1869	$110,766 56
" " (284 miles), 1870	107,899 82
Decrease (2½ per cent.)	$2,866 74
St. Louis & Iron Mountain (310 miles), 1870	$31,943 57
" " (310 miles), 1869	20,808 19
Increase (53½ per cent)	$11,135 38
Pacific of Missouri (355 miles), 1869	$74,677 00
" " (355 miles), 1870	74,224 00
Decrease	$453 00
Toledo, Wabash & Western (522 miles), 1870	$91,382 00
" " (522 miles), 1869	85,274 00
Increase (7 per cent.)	$6,108 00
Union Pacific (1,038 miles) 1870	$139,348 00

FOR THE SECOND WEEK IN NOVEMBER.

Michigan Central (284 miles), 1870	$107 280 18
" " (284 miles), 1869	101,452 98
Increase (5¾ per cent.)	$5,767 20
Des Moines Valley (244 miles), 1870	$18,330 00
" " (162 miles), 1869	17,325 00
Increase (5¾ per cent.)	$1,005 00
Pacific of Missouri (335 miles), 1870	$76.853 00
" " (335 miles), 1869	74,677 00
Increase (3 per cent.)	$2,176 00
Chicago & Alton (465 miles), 1870	$114,151 04
" " (431 miles), 1869	104,741 95
Increase (9 per cent.)	$9,409 09

PERSONAL.

—James S. Craft, formerly President of the Pittsburgh & Steubenville Railroad, and the oldest member of the Pittsburgh bar, died in Pittsburgh on the 18th inst.

—Mr. H. W. Gwinner, General Passenger and Ticket Agent of Pennsylvania Railroad, met with a large part of his staff, comprising the passenger and ticket agents of some half dozen lines controlled by the Pennsylvania Company, in St. Louis last week to counsel together. The Pennsylvania can now ticket people to about any considerable place in the United States over its own roads.

—DeWitt C. Littlejohn, President of the New York & Oswego Midland Railroad Company, has just been elected to the New York Assembly for the eleventh time.

—Mr. J. H. Morley, late Superintendent and Chief Engineer of the Iron Mountain Railroad remains upon the line as Chief Engineer, the offices having been separated and a new superintendent appointed at his own request.

TRAFFIC AND EARNINGS.

—The receipts of the Great Western Railway of Canada, for the week ending, October 28, 1870, were:

Passengers	$30,102 64
Freight and Live Stock	48,934 59
Mails and Sundries	1,960 53
Total receipts for week	$80,997 73
Corresponding week, 1869	89,445 20
Decrease (9⅞ per cent.)	$8,447 47

—The operating expenses of the Highland Railroad line in Scotland for the last half-year were only 33 per cent. of its receipts, which shows it to be one of the most economically managed lines in the world.

—Mr. S. T. Smith, Auditor of the Kansas Pacific Railway Company, makes the following estimate of earnings of the company for the second week in November:

From freight:		
Ordinary	$45,060 00	
Government	420 00	
Total		$45,480 00
From passengers:		
First-class	$20,129 00	
U. S. troops	612 00	
U. S. mails	1,397 92	
Total		$22,141 92
Total estimate		$67,621 92

—The traffic receipts of the Grand Trunk of Canada for the week ending October 29th amounted to £31,400, against £32,000 in the corresponding week of last year, showing a decrease of £600.

—The following is the official statement of the Western Union Telegraph Company for the month of September:

	1869.	1870.
Receipts	$669,706 79	$654,396 86
Expenses	419,729 29	434,820 03
Net Profit	$249,977 50	$319,576 83

An increase in expenses, a decrease in receipts, and a decrease in net profit of about 12 per cent.

OLD AND NEW ROADS.

[Continued from Page 200.]

Ohio & Mississippi.

This company reports as follows to the Ohio Commissioner, for the year ending June 30, 1870:

Amount of capital stock paid in $23,500,000; amount of stock per mile of road, $59,796.44; total funded debt, $6,544,850; floating debt, $317,709.04; total debt, $6,862,559.09; total stock and debt, $30,362,559.04. Length of main line, 340 miles; branches 53 miles; length of track in Ohio, 191½ miles; length of sidings, &c., 11 1-10 miles.

There are on the road in Ohio two wooden bridges, with an aggregate length of 250 feet, and one iron bridge 630 feet long. There are on the road 86 locomotives, 49 passenger cars, 21 express and baggage cars, 913 freight cars, 315 coal cars, and 50 other cars. There where were carried during the year 381,244 passengers at an average rate of 4 cents per mile; 119,449 tons of through freight and 409,253 tons of local freight. Consumed during the year 23,517 cords of wood and 18,013 tons of coal. The earnings for the year from the transportation of passengers were $1,223,710.72; from freight, $1,697,233.27, from mail, $68,200; expenses, $87,513.41. Total earnings, $3,076,657.40. Total operating expenses for the year, $2,216,771.20; net earnings, $859,-886.20; total receipts from all sources, $3,076,657.40; operating expenses and other payments, $3,341,943.42, deficit of payments over receipts, $265,286.02.

The Adams Express Company pay $125 per day for carrying 5 tons of freight daily between Cincinnati and St. Louis, and $1.25 per hundred pounds for all in excess of 5 tons.

There were killed on the road in Ohio 9 cows, 1 colt, 1 mule, 8 hogs, 6 sheep. There were killed during the year two persons. Two persons were injured.

St Louis, Vandalia, Terre Haute & Indianapolis.

By the time table which went into effect on the 20th inst., we see that there are five passenger trains daily each way, which indicates a particularly lively business for a road opened only a few months ago. These trains are two Chicago expresses, one leaving East St. Louis at 7:40 a. m. and the other at 5:40 p. m., Indianapolis time, which is 17 minutes faster than St. Louis time. The Atlantic express with cars running through to New York without change, leaves at 10:50 p. m., the fast line at 6:40 p. m., and the New York express at 8:45 a. m. The time of running between East St. Louis and Indianapolis, 238 miles, is as follows: Atlantic express, 9 hours and 35 minutes; fast line, 9 hours; New York express, 10 hours and 35 minutes. An accommodation train runs between Effingham and Terre Haute, leaving Effingham at 7 in the morning and reaching Terre Haute at 10:15; another runs between Terre Haute and Indianapolis, leaving Terre Haute at 7:05 a. m. and reaching Indianapolis at 10:15 a. m. An accommodation runs between Terre Haute and Greencastle also.

The rapid growth of business on this line is due first to its natural advantages, but also in large part to its admirable passenger and ticket staff, three of whom are well known in Chicago, *viz.*: France Chandler, General Ticket Agent, W. D. S. Anderson, his principal assistant, and Robert Emmett, Eastern Passenger Agent.

Sabula, Ackley & Dakota.

This Iowa extension of the Western Union Railroad is steadily progressing, and about eight miles of iron are now down. A bridge is being built a few miles east of Preston, which will take 700,000 feet of timber. One cut through the "divide," a few miles south-east of Maquoketa, will be about ninety feet deep, through the solid rock.

Great Western of Canada.

This company advertises for tenders for the construction of the third and last division of its Canada Air Line, from Simcoe to Canfield, a distance of thirty miles. These tenders must be presented at the office of George Lowe Reid, Chief Engineer, at Hamilton, by the 15th of December.

The company has issued £750,000 of 6 per cent. bonds in London in order to supply capital for the Air Line. They are sold at 96, and are said to be rapidly taken up at that price.

Toledo, Wabash & Western.

The report of this company to the State Commissioner of Ohio for the year ending June 30, 1870, is in substance as follows:

Total amount of stock, $8,500,000; increase of stock since Junce 30, 1869, $1,500,000; amount of stock per mile of road, $16,314.78; proportion of stock for Ohio, $1,231,765.89; total funded debt, $15,000,000 (no floating debt); amount of debt per mile of road, $28,790.78; total stock and debt, $23,500,000; total stock and debt for Ohio, $3,405,470.53; total cost of entire road and equipment up to June 30, 1870, $23,500,000; cost of road and equipment per mile, $45,105.57; length of main line, 476 miles; length of branches, 45 miles; length of single main track in Ohio, 75½ miles; total length of road in Ohio, 85½ miles.

There are on the road fifteen wooden bridges, with length of 3,639 feet, and three wooden trestles with length of 1,200 feet.

There are on the road 115 locomotives, 50 passenger cars, 29 express and baggage cars, 2,177 freight cars, and 78 other cars.

Number of persons employed in operating road in Ohio, 725.

Number of passengers carried, 665,234; tons of through freight, 253,726; tons of local freight, 541,314.

Earnings for the year, $3,946,242.85; operating expenses, $3,354,442.75; net earnings, $591,800.10.

Total payments in addition to operating expenses, $1,832,472.68. Total receipts from earnings and all other sources, $5,186,915.43. Operating expenses and other payments, $5,186,915.43.

The United States Express Company has the use of the track for $250 per day.

During the year there were two employes killed and one injured.

There were killed on the road during the year, 15 steers, 24 cows, 13 heifers and 3 horses.

Marietta & Cincinnati.

The following is a summary of the report of this company for the year ending June 30, 1870, made to the State Commissioner of Ohio:

Amount of capital stock paid in, $14,620,865; amount of stock per mile, $52,821; total amount of funded and floating debts, $7,996,096; increase of debt since June 30, 1869, $739,100; amount of debt and stock, $22,616,-962; total cost of entire road and equipment to June 30, 1870, $20,622,750; length of single main track laid with iron, 190 8-10 miles; length of branches, 86 miles; sidings, &c., 40 miles; total length of iron, 316 miles.

There are on the road 55 wooden bridges with aggregate length of 8,701 feet; three stone bridges with length of 90 feet, and 264 wooden trestles with length of 31,185 feet. There are on the road 52 locomotives, 24 passenger cars, 14 express and baggage cars, 618 freight cars and 23 other cars. Total number of persons employed in operating the road in Ohio, 2,478.

There were carried during the year 339,245 passengers, 109,605 tons of through freight and 284,738 tons of local freight.

The earnings for the year are $1,381,936. Operating expenses $1,382,093,89; deficit of expenses over earnings $157.86.

There were killed on the road during the year 2 passengers, 4 employes and 9 others. Total, 15. There were 15 persons injured. There were killed during the year 31 horses and mules, 106 cattle, and 89 hogs and sheep; amount of damages paid therefor $6,634.89.

MISCELLANEOUS.

—The last number of *Herapath's Railway Journal* says: "A gentleman acquainted with Canadian affairs observes that neither Mr. Creak nor Mr. Adams, nor yet Mr. Conybeare, hit the mark at the late Grand Trunk meeting; that where the Grand Trunk is wrong is in taking through freight at less rates than the Great Western of Canada, over a route 160 miles longer."

—The London *Railway News* gives the following account of the business of a single line entering London:

"Some idea of the common facilities afforded for locomotion by the railways entering the metropolis may be afforded by the following table, showing the number of trains arriving and departing in the London stations of the Southeastern Railway:

Branches.	Charing Cross. In.	Out.	Tl.	Cannon street. In.	Out	Tl.	London Bridge. In.	Out.	Tl.	Totals. In.	Out.	Grs.
Main line	35	37	72	59	63	122	34	34	68	128	134	262
North Kent	33	34	67	67	69	136	*5	55	110	155	158	313
Mid Kent	13	12	25	24	26	52	19	19	38	56	57	115
Greenwich and local	86	87	173	171	171	342	50	50	100	307	308	615
	167	170	337	323	329	652	158	158	316	648	657	1,305

"This total gives an average of about 54 trains per hour, or very nearly one per minute during the whole 24 hours of the day. Estimating the number for 16 hours per day—say from eight o'clock in the morning till twelve at night—we have an average of rather over 80 trains per hour, or four trains each three minutes, or one train every 45 seconds. The whole of this enormous traffic is carried on with a freedom from casualty and accident, and with an amount of punctuality, which reflects the highest credit upon the organization of the company, while it confers an inestimable boon on the traveling public."

—The Union Pacific Railroad Company furnished rations to contractors during its construction, and of course large purchases of provisions were made. It appears that the stock was not wholly consumed and not entirely well proportioned. A little more than a year ago, we are informed, the company had still on hand *twenty tons* of *black pepper*, *enough*, one would think, to season the whole territory between Omaha and Salt Lake.

LOCOMOTIVE STATISTICS.

Chicago, Rock Island & Pacific.

The following is the report furnished from the General Superintendent's office for the month of September:

ILLINOIS DIVISION.

The number of miles run by trains was as follows:

Passenger trains	25,859
Freight "	109,654
Miscellaneous	9,845
Total number of miles run	155,358

IOWA DIVISIONS.

The number of miles run by trains was as follows:

Passenger trains	29,248
Freight "	99,903
Miscellaneous	26,501
Total	165,652

The average cost per mile run was:

Fuel	7.77 cts.
Oil and waste	0.68 "
Repairs	6.05 "
Total	14.50 cts.
Engineers, firemen and wipers	7.06 "

Average number of miles run to

Pint of oil	18.23
Ton of coal	40.89

The general averages are made up for the whole line. The whole number of locomotives owned by the company is 142, of which 69 are on the Iowa divisions and 73 are on the Illinois Division..

No mileage is reported for two locomotives on the Illinois division and five on the Iowa divisions.

PUBLISHER'S ANNOUNCEMENTS.

WANTS.

☞ SHORT ADVERTISEMENTS will be inserted under this head at ten cents per line for the first insertion, and five cents per line for each subsequent insertion.

WANTED—A completed file of the RAILROAD ADVOCATE published in New York by Zerah Colburn about 15 years ago. A purchaser can be found by applying at this office personally or by letter.

AN ENGINEER experienced in railroad location and construction as Principal Assistant and Chief is open to an engagement. For further information inquire of the editor of this paper.

WANTED.—Twenty-five cents each will be paid for a few perfect copies of the first quarto volume of the RAILROAD GAZETTE of the following dates: June 25, August 13 and August 20, all 1870. Address A. N. KELLOGG, No. 101 Washington street, Chicago.

WANTED Every Railway Traveler in the United States and the Dominion of Canada wants every railway company to use the Thomas Safety Baggage Check. It is in use on over sixty of the best managed roads in the country and has been during the past three years, and not one piece of baggage to which this check has been attached has been lost or miscarried. Every railroad man upon whose road it is in use says:

"*We are fully satisfied after a thorough trial and practical use of the Thomas Safety Baggage Check that both for local and through business it has no equal. It is cheaper, more satisfactory and better adapted to the business than any other check in use.*"

All information in reference to the Thomas Safety Baggage Check will be given by addressing G. F. THOMAS, editor Appleton's Railway Guide, 90, 92 and 94 Grand Street, New York.

SUBSCRIBERS to the RAILROAD GAZETTE who have preserved files from April 1 to October 1, 1870, may have this First Quarto Volume bound, at a charge of $1.50, by sending them to this office.

GREAT WESTERN RAILWAY
OF CANADA.

In addition to the Second Division of the CANADA AIR LINE, Tenders for which are already invited to be in on the 25th of November, the Directors of the Great Western Railway are now prepared to receive

TENDERS

For the Third or Last Division

OF THE CANADA AIR LINE,

From Simcoe to Canfield,

THIRTY MILES.

PLANS AND SPECIFICATIONS

will be on exhibition at the office of GEO. LOWE REID, Esq., Chief Engineer, Hamilton, on and after 28th November; and Sealed Tenders, marked "Tender for Construction of Third Division Canada Air Line, must be in the hands of the undersigned by

10 O'CLOCK ON THE MORNING OF

Thursday, Dec. 15, 1870.

JOSEPH PRICE, Treasurer.

Chief Offices: Hamilton, Ont. 16th Nov., 1870.

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A Trial Train furnished to any Railroad Company, to be paid for only when found satisfactory. Full information furnished on application.

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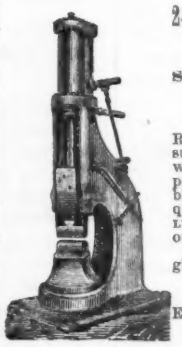

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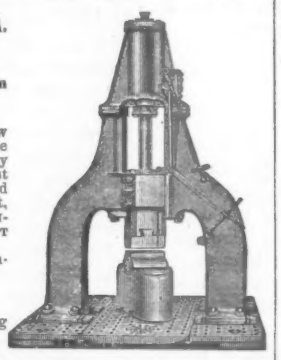
Simple in Construction—Powerful in Action—Convenient in Handling —Moderate in Price!

These Hammers have our Patent Skew Ram, which secures the most extensive die surface, and our patent valve gear; by which is accomplished, with the most perfect adjustment, either the heavy dead blow for drawing down work, or the light, quick blow for finishing, AND THIS WITH ONLY TWO MOVING PIECES—NOTHING TO GET OUT OF ORDER.

All sizes, from 100 lbs. upwards, with single or double frames.

ENGINE LATHES,
Extra Strong and Heavy, capable of doing the heaviest and most accurate work.



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MARTIN STEEL!
Acknowledged by all who have used it to be the best material now made for

Firebox Plates, Locomotive Crank Pins, Piston Rods, Axles,

And all the finer machine purposes, such as

Rollers for Cotton Machinery, Lathe Screws, Sewing Machine Work, &c., &c.

The special features of this Steel are its REMARKABLE TOUGHNESS, its softness and entire freedom from hard spots, which obviate the necessity of annealing before turning.

The process by which this Steel is made differs entirely from any other in use, enabling it to be sold at lower prices than any other good steel, while it possesses properties hitherto unknown, and of the greatest importance for many uses.

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UNION PACIFIC R. R. CO.
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A very extensive Stock of all kinds of

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And are prepared to furnish Contractors, Builders and Jobbers with the following

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Plow Points,	Steel " "
Carts,	Stone Axes,
Cart Harness,	" Tooth Axes,
Round Point Shovels,	Hand Drills,
Spades,	Horse Power Drills,
R. R. Picks,	Anvils,
Steel Pointed Picks,	Steel Punches,
Steel Drills,	Portable Forges,
Striking Hammers,	Horse Pile Drivers,
Crow Bars,	Pile Hammers,
Tamping Picks,	Derrick Castings,
Cast Iron Turntable,	Broad Axes,
Switches, complete,	R. E. Adzes,
Frogs, "	Ship Augers,
Hand Switches,	Buttresses,
Tanks, complete,	Steel Squares,
Wind Mills,	Trowels,
Broad Axe Handles,	Powder,
Hammer "	Tape Fuse,
Pick "	Cotton Fuse,
Hand Pumps,	Glycerine Tubes,
Power "	" Fuse,
Sand "	Electric Exploders,
Fence Posts,	Buildings,
Steel, Iron, Bolts,	Lumber, Box Cars,
Screws, Castings,	Flat Cars, Coaches, &c.

N. B.—The above list of material was purchased by the Contractors to be used in the construction of the U. P. R. R., and on its completion remained on hand as a surplus. Address

Gen. G. M. DODGE,
COUNCIL BLUFFS, Or

J. M. EDDY,
U. P. R. R., OMAHA, Nebraska.

ESTABLISHED 1820.

WM. J. YOUNG & SONS,
MANUFACTURERS OF

Mathematical and Engineering
INSTRUMENTS.

No. 43 NORTH SEVENTH ST.,

Philadelphia.

THE

Commercial & Financial Chronicle,
PUBLISHED WEEKLY

IN NEW YORK,

—IS THE—

Standard Financial Newspaper of the Country.

RUFUS BLANCHARD,
146 Lake St., Chicago,

Has Issued a NEW STYLE of

MAPS!
IN FLEXIBLE CASES,

Which are both cheap and convenient. The following States are now ready: Illinois, Iowa, Missouri, Kansas, Nebraska, Minnesota, Wisconsin, Indiana, Michigan and Ohio. Mailable on receipt of 25 cents. They show the counties, towns and railroads and are fine specimens of workmanship.

CHICAGO & NORTHWESTERN R. W.

Comprising the PRINCIPAL RAILROADS from CHICAGO Directly NORTH NORTH-WEST and WEST.

ALL RAIL TO THE PACIFIC OCEAN!

Great California Line.

TRAINS LEAVE WELLS STREET DEPOT AS FOLLOWS:

8:15 A. M. Cedar Rapids Pass | **9:15 P. M. Night Mail.**
10:30 A. M. Pacific Express. | **9:15 P. M. Rock Island Pass.**
10:30 A. M. Rock Island Exp. | **4:00 P. M. Dixon Passenger.**

For Sterling, Rock Island, Fulton, Clinton, Cedar Rapids, Boone, Denison, Missouri Valley Junction, Sioux City, Council Bluffs and Omaha, there connecting with the

UNION PACIFIC R. R.

For Cheyenne, Denver, Ogden, Salt Lake, the White Pine Silver Mines, Sacramento, San Francisco, and all parts of Nebraska, Colorado, New Mexico, Arizona, Wyoming, Montana, Idaho, Utah, Nevada, and the PACIFIC COAST.

FROM CHICAGO	Hours.	1st Class Fare.	FROM CHICAGO	Days.	1st Class Fare.
To OMAHA.....	23	$20.00	To SACRAMENTO,.	4½	$118.00
" DENVER.....	52	70.75	" SAN FRANCISCO,	5	118.00

TRAINS ARRIVE:—Night Mail, **7.00** a. m.; Dixon Passenger, **11.10** a. m.; Pacific Express, **3:50** p. m.; Rock Island Express, **3:50** p. m.; Cedar Rapids Passenger, **6:50** p. m.

FREEPORT LINE.

9.00 A. M. & 9.45 P. M. For Belvidere, Rockford, Freeport, Galena, Dunleith, and St. Paul.

4.00 P. M., Rockford Accommodation.
5.30 P. M., Geneva and Elgin Accommodation
6.10 P. M., Lombard Accommodation.
5:50 P. M., Junction Passenger.

TRAINS ARRIVE:—Freeport Passenger, **2:30** a. m., **3:00** p. m.; Rockford Accommodation, **11:10** a. m.; Geneva and Elgin Accommodation, **8:45** a. m.; Junction Passenger, **8:10** a. m.; Lombard Accommodation, **6:50** a. m.

WISCONSIN DIVISION.

☞ Trains leave Depot, cor. West Water and Kinzie Sts., daily, Sundays excepted, as follows:

10.00 A. M. DAY EXPRESS, for Janesville, Monroe, Whitewater, Madison, Prairie du Chien, Watertown, Minnesota Junction, Portage City, Sparta, La Crosse, St. Paul, and ALL POINTS ON THE UPPER MISSISSIPPI RIVER; Ripon, Berlin, Fond du Lac, Oshkosh, Neenah, Appleton, and Green Bay.

3.00 P. M., Janesville Accommodation.

5.00 P. M. NIGHT EXPRESS, for Madison, Prairie du Chien, Watertown, Minnesota Junction, Portage City, Sparta, La Crosse, St. Paul, and ALL POINTS ON THE UPPER MISSISSIPPI RIVER; Ripon, Berlin, Fond du Lac, Oshkosh, Menasha, Appleton, Green Bay, and THE LAKE SUPERIOR COUNTRY.

5.30 P. M., Woodstock Accommodation.
6:20 P. M., Barrington Passenger.

TRAINS ARRIVE:—5:30 a. m., **7:45** a. m., **10:10** a. m., **1:00** p. m. and **7:15** p. m.

MILWAUKEE DIVISION.

MILWAUKEE MAIL,		**8:00 A. M.**
EXPRESS, (ex. Sun.) Waukegan, Kenosha, Racine and Milwaukee,	**9:45 A. M.**	**5:00 P. M.**
EVANSTON PASSENGER,		**11:40 A. M.**
HIGHLAND PARK PASSENGER,		**1:15 P. M.**
MILWAUKEE ACCOMMODATION, with Sleeping Car attached.		**11:00 P. M.**
EVANSTON ACCOMMODATION, (Daily,) from Wisconsin Div. Depot		**1:30 P. M.**
KENOSHA ACCOMMODATION, (Sundays excepted) from Wells St. Depot		**4:15 P. M.**
AFTERNOON PASSENGER, from Milwaukee Div. Depot		**5:00 P. M.**
WAUKEGAN ACCOMMODATION, (except Sundays) from Wells St. Depot		**5:25 P. M.**
WAUKEGAN PASSENGER, (Sundays excepted) from Wells St. Depot		**6:15 P. M.**

TRAINS ARRIVE:—Night Accommodation, with Sleeping Car, **5:00** a. m.; Day Express, **4:10** p. m. Milwaukee Mail, **10:10** a. m.; Afternoon Passenger, **8:00** p. m.; Waukegan Accommodation, **8:25** a. m.; Kenosha Accommodation, **9:10** a.m.; Evanston Accommodations, **1.40** and **4.00** p. m.; Waukegan Passenger, **7:55** a. m.; Highland Park Passenger, **3.45** p. m.

PULLMAN PALACE CARS ON ALL NIGHT TRAINS.

THROUGH TICKETS Can be purchased at all principal Railroad Offices East and South, and in Chicago at the Southeast corner of Lake and Clark Streets, and at the Passenger Stations as above.

H. P. STANWOOD, Gen. Ticket Agt.
GEO. L. DUNLAP, Gen'l Supt.

Western Union Railroad.

CHICAGO & NORTHWESTERN DEPOT, CHICAGO. | MILWAUKEE & CHICAGO DEPOT, MILWAUKEE.

THE DIRECT ROUTE!

CHICAGO, RACINE & MILWAUKEE,

— TO —

Beloit, Savanna, Clinton, Pt. Byron, Davenport, Mineral Point, Madison, Freeport, Fulton, Lyons, Rock Island, Sabula, Galena, Dubuque, Des Moines, Council Bluffs,

OMAHA, SAN FRANCISCO

AND ALL PRINCIPAL POINTS IN

Southern and Central Wisconsin, Northern Illinois, and Central and Northern Iowa.

FRED. WILD, Gen. Ticket Agent.
D. A. OLIN, Gen. Superintendent.

CRERAR, ADAMS & CO.,

MANUFACTURERS AND DEALERS IN

Railroad Supplies!

—AND—

CONTRACTORS' MATERIAL.

11 and 13 Wells Street,

CHICAGO, ILL.

Manufacturers of IMPROVED HEAD-LIGHTS for Locomotives, Hand and Signal Lanterns, Car and Station Lamps, Brass Dome Casings, Dome Mouldings, Cylinder Heads, and Car Trimmings, of Every Description.

Pan-Handle

— AND —

Penn'a Central Route East!

☞ SHORTEST AND QUICKEST ROUTE, VIA COLUMBUS, TO ☜

PITTSBURGH, BALTIMORE, PHILADELPHIA & NEW YORK

On and after Sunday, NOVEMBER 20th, 1870, Trains for the East will run as follows:

[DEPOT CORNER CANAL AND KINZIE STS., WEST SIDE.]

7:40 A. M. DAY EXPRESS.

[SUNDAYS EXCEPTED.] Via Richmond. Arriving at

COLUMBUS....	3:00 A. M.	HARRISBURG..	10:35 P. M.	NEW YORK....	6:40 A. M.
PITTSBURGH..	12:15 M.	PHILADELPHIA	3:10 A. M.	BALTIMORE....	2:30 A. M.
WASHINGTON..	5:45 A. M.	BOSTON.....	5:05 P. M.		

7:10 P. M. NIGHT EXPRESS.

[SATURDAYS EXCEPTED.] Arriving at:

COLUMBUS..	11:15 A. M.	HARRISBURG..	5:20 A. M.	NEW YORK...	11:40 A. M.
PITTSBURGH..	7:25 P. M.	PHILADELPHIA	9.50 A. M.	BALTIMORE...	9:30 A. M.
WASHINGTON.	1:10 P. M.	BOSTON.....	11:50 P. M.		

Palace Day and Sleeping Cars

Run Through to COLUMBUS, and from Columbus to NEW YORK, WITHOUT CHANGE!

ONLY ONE CHANGE TO NEW YORK, PHILADELPHIA, OR BALTIMORE!

CINCINNATI & LOUISVILLE AIR LINE SOUTH.

35 Miles the Shortest Route to Cincinnati,
18 Miles the Shortest Route to Indianapolis and Louisville.

3 Hours the Quickest Route to Cincinnati!

THE SHORTEST AND BEST ROUTE TO

Columbus, Chillicothe, Hamilton, Wheeling, Parkersburg, Evansville, Dayton, Zanesville, Marietta, Lexington, Terre Haute, Nashville,

ALL POINTS IN CENTRAL & SOUTHERN OHIO, & INDIANA, KENTUCKY & VIRGINIA.

— QUICK, DIRECT AND ONLY ALL RAIL ROUTE TO —

New Orleans, Memphis, Mobile, Vicksburg, Charleston, Savannah,

AND ALL POINTS SOUTH.

Cincinnati, Indianapolis and Louisville Trains run as follows:

THROUGH WITHOUT CHANGE OF CARS!

7.40 A. M. (Sundays excepted) Arriving at		7.40 P. M. (Saturdays excepted.) Arriving at	
LOGANSPORT	1:15 P. M.	LOGANSPORT	1:15 A. M.
KOKOMO	2:33 P. M.	KOKOMO	2:31 A. M.
CINCINNATI	10:10 P. M.	CINCINNATI	9:35 A. M.
INDIANAPOLIS	5:00 P. M.	INDIANAPOLIS	5:40 A. M.
LOUISVILLE	11:20 P. M.	LOUISVILLE	3:50 P. M.

Lansing Accommodation: Leaves 3:40 P. M. Arrives 10:55 A. M.

PULLMAN'S PALACE SLEEPING CARS!

Accompany all Night Trains between Chicago and Cincinnati or Indianapolis.

☞ Ask for Tickets **via COLUMBUS** for the East, and **via "The AIR LINE"** for Cincinnati, Indianapolis, Louisville and points South. Tickets for sale and Sleeping Car Berths secured at **95 RANDOLPH STREET, CHICAGO,** and at Principal Ticket Offices in the West and Northwest.

WM. L. O'BRIEN, Gen. Pass. and Ticket Agent, Columbus.
I. S. HODSDON Northwestern Pass. Agt. Chicago.

D. W. CALDWELL Gen Supt. Columbus.

MOORE
Steel Elastic Car Wheel Co.

OF NEW JERSEY.

Proprietors of

MOORE'S PATENT

FOR THE MANUFACTURE OF

ELASTIC CAR WHEELS,

FOR PASSENGER AND SLEEPING COACHES.

Noiseless, Safe, Durable and Economical.

Also, Manufacturers of

CAR WHEELS OF EVERY DESCRIPTION.

H. W. MOORE, President.
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Works, cor. Green and Wayne Sts., JERSEY CITY, N. J
P. O. Address—Box 129, Jersey City, N. J.

American Compound Telegraph Wire.

More than 3000 Miles now in Operation,

Demonstrating beyond question its superior working capacity, and great ability to withstand the elements. For RAILROAD LINES connecting a single wire with a large number of Stations, and for long circuits, this wire is peculiarly adapted; the large conducting capacity secured by the copper, with other advantages, rendering such lines fully serviceable during the heaviest rains.

Having a core of steel, a small number of poles only are required, as compared with iron wire construction, thereby preventing much loss of the current from escape and very materially reducing cost of maintenance OFFICE AMERICAN COMPOUND TELEGRAPH WIRE CO.
234 West 29th Street, New York.

BLISS, TILLOTSON & CO., Western Agents,
247 South Water Street, Chicago.

THE FAVORITE THROUGH PASSENGER ROUTE!

Chicago, Burlington & Quincy
RAILROAD LINE.

3 THROUGH EXPRESS TRAINS DAILY!

FROM CHICAGO	Hours.	1st Class Fare.	FROM CHICAGO	Days.	1st Class Fare.
TO OMAHA, - - -	23	$20.00	TO DENVER, - -	2½	$65.00
" ST. JOSEPH, - -	21	19.50	" SACRAMENTO, -	4½	118.00
" KANSAS CITY, -	22	20.00	" SAN FRANCISCO,	5	118.00

TRAINS LEAVE CHICAGO from the Great Central Depot, foot of Lake Street, as follows:

BURLINGTON, KEOKUK, COUNCIL BLUFFS & OMAHA LINE

7:40 A. M. MAIL AND EXPRESS, (Except Sunday,) stopping at all stations; making close connections at Mendota with Illinois Central for Amboy, Dixon, Freeport, Galena, Dunleith, Dubuque, LaSalle, El Paso, Bloomington, &c.

10:45 A. M. PACIFIC FAST LINE, (Except Sunday,) stopping at Riverside, Hinsdale, Aurora, Leland, Mendota, Princeton, Buda, Kewanee, Galva, Galesburg, and all stations West and South of Galesburg.
☞ ELEGANT DAY COACHES and **PULLMAN PALACE DRAWING ROOM CARS** are attached to this train daily from Chicago

TO COUNCIL BLUFFS & OMAHA WITHOUT CHANGE!

5.00 P. M. EVENING EXPRESS, (Daily, except Saturday,) for Burlington, Ottumwa, DesMoines, Nebraska City, Council Bluffs, Omaha, and all points West. **Pullman Drawing Room Sleeping Car** attached to this Train daily from **Chicago to Ottumwa,** and Elegant Day Coaches, from **Chicago to Council Bluffs and Omaha, without change!**

11:30 P. M. NIGHT EXPRESS, (Daily, except Saturday,) stopping at all principal Stations between Chicago and Burlington. Elegant Day Coaches, and a **Pullman Palace Sleeping Car** are attached to this Train from **Chicago to Burlington, without change!** This is the Route between

CHICAGO, COUNCIL BLUFFS & OMAHA,

—RUNNING THE CELEBRATED—

Pullman Palace Dining Cars!

49 MILES THE SHORTEST ROUTE BETWEEN

Chicago & Keokuk,

And the Only Route Without Ferrying the Mississippi River!

QUINCY, ST. JOSEPH, LEAVENW'TH & KANSAS CITY LINE.

10:45 A. M. PACIFIC EXPRESS, (Daily, except Sunday,) with ELEGANT DAY COACHES and PULLMAN'S PALACE SLEEPING CARS attached, running through from Chicago to KANSAS CITY, **Without Change!**

5:00 P. M. EVENING EXPRESS, (Daily,) with **Pullman Palace Drawing Room Sleeping Car** attached running through from Chicago to QUINCY, KANSAS CITY, LAWRENCE, TOPEKA and DENVER, WITHOUT CHANGE.

11:30 P. M. NIGHT EXPRESS, (Daily, except Saturday,) with **Pullman Palace Sleeping Car** attached from Chicago to GALESBURG: PALACE DAY COACHES from Chicago to QUINCY, **Without Change!**

64 MILES THE SHORTEST AND ONLY ROUTE BETWEEN

Chicago and Kansas City!

WITHOUT CHANGE OF CARS OR FERRY.

115 MILES The Shortest Route bet. Chicago & St. Joseph.

THE SHORTEST, BEST AND QUICKEST ROUTE BETWEEN CHICAGO AND

Atchison, Weston, Leavenworth, Lawrence,

AND ALL POINTS ON THE KANSAS PACIFIC R'Y.

Local Trains Leave { RIVERSIDE & HINSDALE ACCOMMODATION, 7:00 A. M. 1:30 & 6:15 P. M.
MENDOTA PASSENGER.....4:15 P. M.
AURORA PASSENGER.....5:30 P. M.

Ask for Tickets via Chicago, Burlington & Quincy Railroad, which can be obtained at all principal offices of connecting roads, and at Company's office in Great Central Depot, Chicago at as low rates as by any other route.

ROB'T HARRIS, Gen'l Superintendent, CHICAGO.
SAM'L POWELL, Gen'l Ticket Agent, CHICAGO.
E. A. PARKER, Gen. West. Pass. Agt., CHICAGO.

THE GREAT THROUGH PASSENGER ROUTE TO KANSAS

IS VIA THE OLD RELIABLE

HANNIBAL & ST. JOSEPH
SHORT LINE.

Crossing the Mississippi at Quincy and the Missouri at Kansas City on New Iron Bridges; running Three Daily Express Trains, Through Cars and Pullman Sleeping Palaces from Chicago & Quincy to St. Joseph & Kansas City.

The Advantages gained by this Line over any other Route from Chicago, are:

115 MILES THE SHORTEST!

To St. Joseph, Atchison, Hiawatha, Waterville, Weston, Leavenworth,

64 MILES THE SHORTEST!

To Kansas City, Fort Scott, Lawrence, Ottawa,

Garnett, Iola, Humboldt, Topeka, Burlingame, Emporia, Manhattan, Fort Riley, Junction City, Salina, Ellsworth, Hays, Sheridan, Olathe, Paola, Cherokee Neutral Lands, Baxter Springs, Santa Fe, New Mexico, and all Points on the KANSAS PACIFIC, and MISSOURI RIVER, FT. SCOTT & GULF R. R's, with which we connect at Kansas City Union Depot.

THIS BEING THE SHORTEST LINE AND QUICKEST, is consequently the cheapest; and no one that is posted thinks of taking any other Route from Chicago to reach principal points in

Missouri, Kansas, Indian Territory, or New Mexico.

DAILY OVERLAND STAGES from west end Kansas Pacific Railway, for Pueblo, Santa Fe, Denver, and points in Colorado and New Mexico.

THIS is also a most desirable Route, via St. Joseph, to Brownsville, Nebraska City, Council Bluffs, and Omaha, connecting with the Union Pacific Railroad for Cheyenne, Denver, Salt Lake, Sacramento, San Francisco, and the Pacific coast.

Through Tickets for Sale at all Ticket Offices. Baggage Checked Through, and Omnibus Transfers and Ferriage avoided.

P. B. GROAT, Gen. Ticket Agent. HANNIBAL, MO.
GEO. H. NETTLETON, Gen. Supt. HANNIBAL, MO.

Old, Reliable, Air-Line Route!

CHICAGO, ALTON & ST. LOUIS R. R.

SHORTEST, QUICKEST AND ONLY DIRECT ROAD TO

Bloomington, Springfield, Jacksonville, Alton

— AND —

ST. LOUIS!

WITHOUT CHANGE OF CARS.

THE ONLY ROAD MAKING IMMEDIATE CONNECTIONS AT ST. LOUIS WITH MORNING AND EVENING TRAINS

—FOR—

ATCHISON, LEAVENWORTH, KANSAS CITY,

Lawrence, Topeka, Memphis, New Orleans,

And All Points South and Southwest.

☞ TRAINS leave CHICAGO from the West-side Union Depot, near Madison Street Bridge. ☜

EXPRESS MAIL, [Except Sundays]	8:10 A. M.
LIGHTNING EXPRESS, [Except Saturdays and Sundays]	9:50 P. M.
NIGHT EXPRESS, [Daily]	6:00 P. M.
JOLIET ACCOMMODATION, [Except Sundays]	4:40 P. M.
JACKSONVILLE EXPRESS, [Daily]	6:00 P. M.

Trains arrive at Chicago at 8.00 P. M., 8.30 A. M. and 6:00 A. M. Joliet Accom., 9.40 A. M.

This is the ONLY LINE Between CHICAGO & ST. LOUIS RUNNING

Pullman's Palace Sleeping and Celebrated Dining Cars!

BAGGAGE CHECKED THROUGH.

Through Tickets can be had at the Company's office, No. 55 Dearborn street, Chicago, or at the Depot, corner of West Madison and Canal streets, and at all principal Ticket Offices in the United States and Canada. Rates of Fare and Freights as low as by any other Route.

A. NEWMAN, Gen. Pass. Agent. **J. C. McMULLIN, Gen. Supt.**

North Missouri R. R.

PASSENGERS FOR

KANSAS AND THE WEST,

ARE REMINDED THAT

THE NORTH MISSOURI R. R.

— IS —

11 MILES SHORTER than any other Route!

BETWEEN

St. Louis and Kansas City.

15 Miles Shorter between ST. LOUIS and LEAVENWORTH

— AND —

49 MILES SHORTER TO ST. JOSEPH!

THAN ANY OTHER LINE OUT OF ST. LOUIS.

☞ **Three Through Express Trains Daily!** ☜

Pullman's Celebrated Palace Sleeping Cars on all Night Trains!

☞ **FOR TICKETS,** apply at all Railroad Ticket Offices, and see that you get your Tickets via St. Louis and North Missouri Railroad.

C. N. PRATT, Gen. Eastern Agt., 111 Dearborn-st. CHICAGO.
S. H. KNIGHT, Gen. Superintendent, ST. LOUIS.

JAS. CHARLTON, Gen. Pass. and Ticket Agt., St. Louis.

Pacific Railroad of Missouri.

THE MOST DIRECT AND RELIABLE ROUTE FROM ST. LOUIS THROUGH TO

KANSAS CITY, LEAVENWORTH & ATCHISON,

☞ WITHOUT CHANGE OF CARS! ☜

Close Connections at KANSAS CITY with Missouri Valley, Missouri River, Ft. Scott & Gulf, and Kansas Pacific R'ys, for Weston, St. Joseph, Junction City, Fort Scott, Lawrence, Topeka, Sheridan, Denver, Fort Union, Santa Fe, and

ALL POINTS WEST!

☞ At SEDALIA, WARRENSBURG and PLEASANT HILL, with Stage Lines for Warsaw, Quincy, Bolivar, Springfield, Clinton, Osceola, Lamar, Carthage, Granby, Neosho, Baxter Springs, Fort Gibson, Fort Smith, Van Buren, Fayetteville, Bentonville.

PALACE SLEEPING CARS on all NIGHT TRAINS.

Baggage Checked Through Free!

THROUGH TICKETS for sale at all the Principal Railroad Offices in the United States and Canadas. **Be Sure and Get your Tickets over the PACIFIC R. R. OF MISSOURI.**

W. B. HALE, Gen. Pass. and Ticket Agt.
THOS. McKISSOCK. General Superintendent.

LAKE SHORE
—AND—
MICHIGAN SOUTHERN R.W.

THE GREAT THROUGH LINE BETWEEN

CHICAGO, BUFFALO & NEW YORK,

WITHOUT CHANGE!

AND THE ONLY RAILWAY

RUNNING PALACE COACHES THROUGH!

—BETWEEN—

CHICAGO & NEW YORK, via BUFFALO

☞ WITHOUT TRANSFER OF PASSENGERS! ☜

All Trains Stop at Twenty-Second Street to Take and Leave Passengers. Baggage Checked at that Station for all Points East.

4 EXPRESS TRAINS DAILY, [Sundays Excepted,] Leave Chicago from the New Depot, on Van Buren St., at the head of La Salle Street, as follow

7:30 A. M. MAIL TRAIN.
VIA OLD ROAD AND AIR LINE. SUNDAYS EXCEPTED.

Leaves 22d Street 7:45 A. M. Stops at all Stations. **Arrives**—Toledo, 6:30 P. M.

11:30 A. M. SPECIAL NEW YORK EXPRESS,
-A AIR LINE. SUNDAYS EXCEPTED.

Leaves—Twenty-Second Street, **11:45 A. M. Arrives**—Elkhart, 2:55 P. M.; Cleveland 10:40 P. M.; Buffalo, 4:10 A. M.: New York, 5:30 P. M.; (Chicago Time) Boston, 11:45 P. M.

This Train has PALACE SLEEPING COACH Attached, Running

THROUGH TO ROCHESTER, WITHOUT CHANGE!

IN DIRECT CONNECTION WITH

Wagner's Celebrated Drawing-Room Coaches on N. Y. Central R. R.

Only Thirty Hours, Chicago to New York!

5:15 P. M. ATLANTIC EXPRESS (Daily),
VIA OLD ROAD.

Leave—Twenty-Second Street **5:30 P. M. Arrives**—Laporte, 8:10 P. M. (Stops 20 minutes or Supper); arrives at Toledo, 2:50 A. M.; Cleveland, 7:35 A. M. (30 minutes for Breakfast); arrives at Buffalo, 1:50 P. M.; Rochester, 5:10 P. M. (30 minutes for Supper); connects with **Sleeping Coach running Through from Rochester to Boston Without Change,** making but **One Change between Chicago and Boston.**

NEW AND ELEGANT SLEEPING COACH Attached to this Train, Running THROUGH from CHICAGO TO NEW YORK WITHOUT CHANGE! Arrives at NEW YORK, 6:40 A. M.

9:00 P. M. NIGHT EXPRESS
VIA AIR LINE. (DAILY EXCEPT SAT. & SUN.)

Leaves—Twenty-Second Street, **9:15 P. M. Arrives**—Toledo, 6:00 A. M. (30 minutes for Breakfast); arrives at Cleveland, 10:35 A. M.; Buffalo, 5:30 P. M.; New York, 11:00 A. M.; Boston, 3:50 P. M.

KALAMAZOO DIVISION.

Leave Chicago 11:30 A. M. Arrive at Kalamazoo 5:30 P. M.; Grand Rapids, 8:15 P. M.

Leave Chicago 9:00 P. M. Arrive at Kalamazoo 7:10 A. M.; Grand Rapids, 10:20 A. M.

Elkhart Accommodation leaves Chicago, 3:30 P. M. Arrives at Elkhart, 8:20 P. M.

☞ There being no heavy grades to overcome, or mountains to cross, the road bed and track being the smoothest and most perfect of any railway in the United States, this Company run their trains at a high rate of speed with perfect safety.

☞ Travelers who wish to SAVE TIME and make SURE CONNECTIONS, purchase Tickets via

LAKE SHORE & MICHIGAN SOUTHERN R'Y.

THE ONLY LINE RUNNING THROUGH BETWEEN CHICAGO AND BUFFALO, WITHOUT TRANSFER, and in Direct Connection with NEW YORK CENTRAL RAILROAD and ERIE RAILWAY.

General Ticket Office for Chicago, No. 56 Clark Street.

CHAS. F. HATCH,
General Superintendent, CLEVELAND, OHIO.

F. E. MORSE,
General Western Passenger Agent, CHICAGO.

ILLINOIS CENTRAL RAILROAD.

PASSENGER TRAINS LEAVE CHICAGO FROM THE GREAT CENTRAL DEPOT, FOOT OF LAKE ST.

ST. LOUIS AND CHICAGO
THROUGH LINE.

9:30 A. M. DAY EXPRESS Sundays Ex,
Arriving in ST. LOUIS at 10:15 P. M.

☞ This Train Reaches St. Louis ONE HOUR & FIFTEEN MINUTES in Advance of any other Route! ☜

8:30 P. M. FAST LINE. Saturdays Excepted.
Arriving at ST. LOUIS at 8:00 A. M.

AT ST. LOUIS, Direct Connections are Made FOR

Jefferson City, Sedalia, Pleasant Hill, Macon, Kansas City,

LEAVENWORTH, ST. JOSEPH & ATCHISON,

—Connecting at KANSAS CITY for—

LAWRENCE, TOPEKA, JUNCTION CITY, SALINA, SHERIDAN, &c.

CAIRO, MEMPHIS AND NEW ORLEANS LINE.

9:30 A. M. CAIRO MAIL, Sundays Excepted.
Arriving at **Cairo** 2:30 A. M., **Memphis** 12:40 P. M., **Mobile** 9:40 A. M **Vicksburg** 9:30 A. M., **New Orleans** 11:10 A. M.

8:30 P. M. CAIRO EXPRESS, Except Saturdays.
Arriving at **Cairo** 3:15 P. M., **Memphis** 2:30 A. M., **Vicksburg** 5:00 P. M., **New Orleans** 1:30 A. M.

4:55 P. M. CHAMPAIGN PASSENGER,
Arriving at **Champaign** at 11:15 P. M.

☞ THIS IS THE ONLY DIRECT ROUTE TO

Humboldt, Corinth, Grand Junction, Little Rock, Selma, Canton, Grenada, Columbus, Meridian, Enterprise,

MEMPHIS, VICKSBURG, NEW ORLEANS & MOBILE.

At NEW ORLEANS, connections are made for

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